Cashing In on the Spring Overhauling

GENERAL LIBRARY
APR -1 1919
UNIV. OF MICH.
Engineering Library

MOTOR AGE

Volume XXXV
Number 13

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, MARCH 27, 1919

Fifteen Cents a Copy
Three Dollars a Year

Essex Demand Is Tremendous

New Type Fine Car Is Motordom's Favorite

Sales Limited Only by Output

Essex sales this year will only be limited by the number of cars that can be built. Essex dealers and distributors have been wiring for increased allotments and deliveries since the first Essex reached them. Never before in the history of motordom has the demand for a new car been so great.

The instant hit that the Essex has made with motorists shows an appreciation for value that does not have to be worked up. Essex enthusiasm has been spontaneous. It has resulted in sales and profits for Essex dealers. It means business growth and reputation.

The Essex fills a place in motordom long kept vacant. It meets the demand for a car in which the owner can take both pride and comfort without excessive cost. The Essex is a light weight car, easy to run, economical in upkeep, and low in first cost. In riding comfort, endurance and beauty it can be compared only with the highest priced and largest cars.

The praise you have heard of the Essex indicates why the only limit to Essex sales is the size of the dealer's allotment.

Essex dealer standards are high. There are only a few opportunities left for those who measure up to them. If you write now you may be chosen to share in the profits and growth of Essex prosperity.

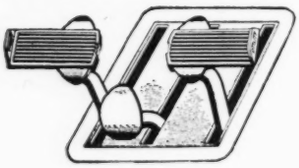
ESSEX MOTORS
DETROIT
U.S.A.

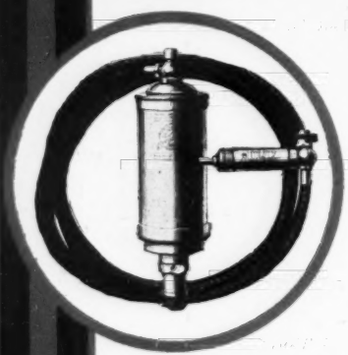
(D)

Entered as second-class matter Sept. 19, 1899, at the post-office at Chicago, Ill., under Act of March 3, 1879.

UTILITY
Automotive Products

Look in the Jobbers' Catalogs and You'll Find





UTILITY Pump for *All* Cars $12.00
For Fords $7.50

UTILITY Rim Wrench for *All* Cars $1.75

UTILITY Pedals
The "Absolutely Necessary" Accessory for Fords

You—a dealer in automotive products—know the hardest man in the industry for the manufacturer to sell. That man is the jobber—**your** jobber and all the rest, because he only buys the best. That's why we ask you to **look in the jobbers' catalogs** and find UTILITY Pedals. They are there—as owners say—"The **Absolutely Necessary** Accessory for Fords."

UTILITY Disappearing Truck Body.
For Fords, Price $38.50

UTILITY Universal Wrench Set for All Cars $3.50

Used and Recommended by Those Who Know

The final test of any accessory is the verdict of the man who buys it. In every instance owners of Ford cars have backed up the judgment of your jobber by declaring the Utility Pedal for Fords **essential.**

There is a big increasing demand for Utility Pedals. Your jobber and all Utility Pedal users will advise you **to stock them now for sales.**

DEALERS—Order from your jobber
JOBBERS—Get in touch with us

HILL PUMP VALVE COMPANY
Manufacturers of UTILITY Products
Archer Avenue and Canal Street, CHICAGO, ILL.

Sales Department
THE ZINKE CO., 1323 S. Michigan Avenue, Chicago, Ill.

UTILITY Protected Heater
For All Cars $9.00 to $25.00

HILL PUMP VALVE CO. UTILITY CHICAGO U.S.A.

LOOK FOR THIS TRADE MARK

HILL PUMP VALVE CO. UTILITY CHICAGO U.S.A.

LOOK FOR THIS TRADE MARK

MOTOR AGE

Published Every Thursday by

THE CLASS JOURNAL COMPANY

MALLERS BUILDING
59 E. Madison St., CHICAGO

HORACE M. SWETLAND, *Pres.* W. I. RALPH, *Vice-Pres.*
E. M. COREY, *Treas.* A. B. SWETLAND, *Gen. Mgr.*

Member Audit Bureau of Circulations; Member Assoc. Business Papers, Inc.

Vol. XXXV Chicago, March 27, 1919 No. 13

CONTENTS

Copyright 1919 by THE CLASS JOURNAL COMPANY

Cashing In on Spring Overhauling.. 7
Ascot Race 11
Editorial 12
Selling Tractors 13
Texas Motor Laws 14
Stephens Distributers Meet..... 20
Bill Strong 22
Garage Planning 24
Tractor Service in South..... 26
Engine Overhauling II..... 28
Maintenance Data Sheet..... 31
Electrical Equipment 32
Tractor Specification Tables..... 42
Wiring Diagram Chart..... 46

DEPARTMENTS

Readers' Clearing House..... 34
Motor Car Repair Shop..... 47
Service Equipment 48
Among the Makers and Dealers..... 49
From the Four Winds..... 50

Advertisers' Index—Next to Last Page

MOTOR AGE

MALLERS BUILDING **Phone Randolph 6960**
CHICAGO **Cable Address "Motage"**

E. E. HAIGHT, Manager
DAVID BEECROFT, Directing Editor
DARWIN S. HATCH, Managing Editor

BRANCH OFFICES

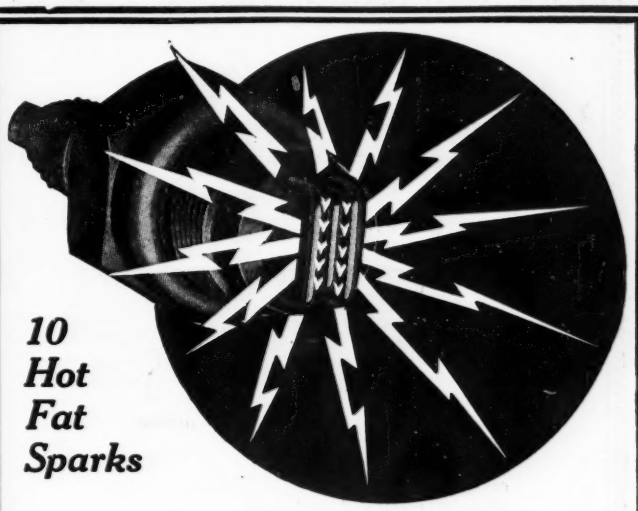
DETROIT, 95 Fort St., W. Phone Main 1351
CLEVELAND, 536-540 Guardian Bldg. Phone Main 1142
NEW YORK CITY, U. P. C. Bldg., 239 W. 39th St. Phone Bryant 8760
PHILADELPHIA, Widener Bldg., Phone Walnut 2727

SUBSCRIPTION RATES

United States, Mexico and U. S. Possessions..$3.00 per year
Canada ..... 5.00 per year
All Other Countries in Postal Union..... 6.00 per year
Single Copies .....15 cents

Entered as second-class matter, September 19, 1899, at the Post Office, Chicago, Illinois, under Act of March 3, 1879.

Owned by UNITED PUBLISHERS CORPORATION, 243 W. 39th St., New York, H. M. Swetland, Pres.; Charles S. Phillips, Vice-Pres.; W. H. Taylor, Treas.; A. C. Pearson, Secretary.



10 Hot Fat Sparks

National

BIG POWER SPARK PLUGS

are equipped with big "Spark Power," oversize electrodes of extra heavy wire—designed specially to ignite low grade oils that have a tendency to slow, lazy ignition. They will not fuse or warp.

Tractor Special

—Heavy Stone Insulator

Practically unbreakable—heat proof—oil proof—trouble proof. A sturdy-oversize, big power, dependable plug that stands up under heavy duty requirements, and is unequaled for steady service and economy of fuel.

Made in all sizes—to fit any motor, for air, land and water service. Every one is carefully inspected, rigidly tested and fully guaranteed.

Prices (in U. S. A.)
Standard Plugs - $1.00 Each
Tractor Special - 2.00 Each
Sold by All Reliable Dealers

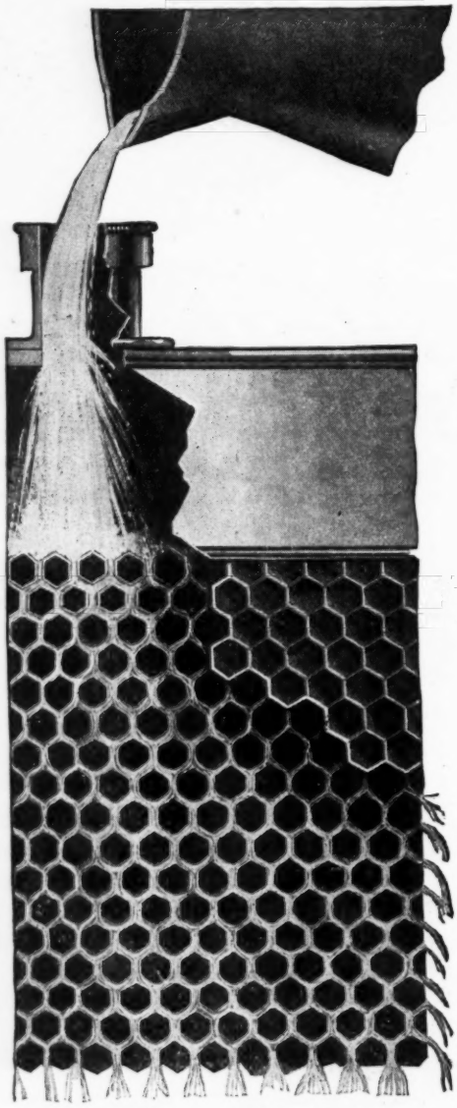
Catalog of Sizes Mailed to Dealers on Request.

BERGIE NATIONAL SPARK PLUG CO.
307 E. State St., Rockford, Ill.

New York Pittsburgh Atlanta San Francisco Dallas

Export Dept., Werner & Butts 336 Whitehall Bldg., New York, U. S. A.

Supreme in Cooling Efficiency



Direct Cooling. One of several exclusive Fedders features—ask about the others

Direct Cooling

THE core of the Fedders Genuine Honeycomb Radiator is composed of Individual Cellular Tubes placed in a horizontal position and joined at their expanded ends to form circulating water spaces on *all* sides of *each* tube, completely surrounding the air space.

There are no dead spaces, no projecting fins, nor any other indirect cooling surfaces. Practically every bit of metal is in *direct contact* with water on one side and air on the other. The Fedders Genuine Honeycomb has 100% Cooling Efficiency.

The above are some of the reasons why the U. S. Government standardized this type for airplanes—the service that demands most from radiators.

Do not confuse this genuine *Tube* radiator with any of the various ribbon types made of sheets rolled and joined together *to resemble tubes*.

We are again able to offer this Radiator for civil use—and at a price in keeping with the more scientific and economical methods of manufacture we have recently developed.

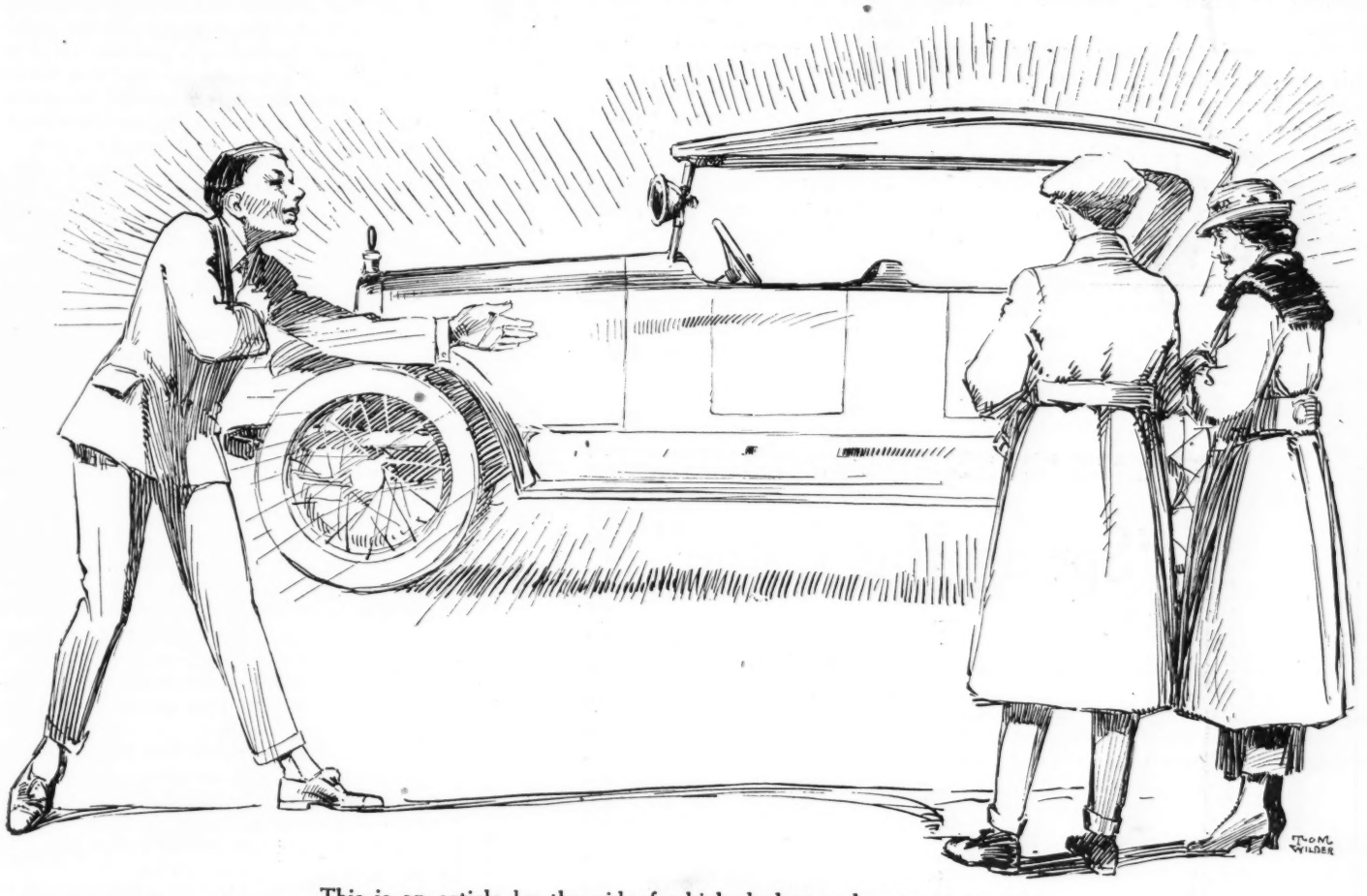
FEDDERS MAN'F'G CO., INC., BUFFALO, N. Y.

FEDDERS

GENUINE HONEYCOMB RADIATORS

Vol. XXXV, No. 13 Chicago, March 27, 1919 $3.00 Per Year

MOTOR AGE



This is an article by the aid of which dealers and garagemen can introduce to the owners cars made new again by proper overhauling

Cashing In on Spring Overhauling

HOW THE DEALER AND GARAGEMAN CAN SELL THIS SERVICE

THIS is the month when you ought to get set on pretty near all the overhauling jobs you have to do this spring. Get these jobs off before the touring season begins. Get them out of the way before the demands of the open motoring season set in with all their sudden calls.

You are not going to get the owners to bring their cars in at the right time, however, unless you persuade them. You're not going to persuade them by sitting around waiting for them to look up your place of business. Neither are you going to start them your way merely by getting ready to handle the work in great shape. That, however, you by all means should have done already. The first letter in the alphabet of any dealer or garageman today should be an "s" for that stands for system. Any shop without system is lost no matter what the equipment. No matter what the tools and time-saving devices for giving cars a thorough overhauling in the spring, that equipment is not going to function to the fullest without the proper system back of it.

Just where does system come in here, you say?

In the first place, system means that you do some thinking, some visualizing as to what the future months have in store for your business. Then system prepares for that visualized future by laying the scene beforehand. It would be a pretty thing if the curtain on the play went up before the scene

was set and all the stars and lesser satellites wait for the sceneshifter to run the artificial trees and what not into place. Well, it is just about as bad if you let your preparations wait until the owners get ready to bring in their cars for the spring overhauling. It will be just as bad if you wait to see if you have enough help for the rush season until the season is nearly over.

Get ready to give service on spring overhauling and then start the ball rolling by attracting owners to your shop.

Don't wait until the owner wants his car in a hurry. If you do, you'll either have to sacrifice your service standards and do a poor job quickly or perhaps lose the work by inability to comply with the owner's demands.

Get the cars into your shop to-day instead of tomorrow.

Get the owners to bring their cars in this week instead of next month.

How?

There are various ways you can do this. Two are:

1—Advertise in your local newspapers.

2—Circularize.

You might use the advertisement shown herewith. That is what it is for. Do use it. You might use the letter that is shown herewith. That is what that is for also. Use both of these and then make more effort. Sell your service.

One good point to remember here, however, is that you should be ready to take care of customers you may attract by advertising, circularizing or other efforts. Sell your service, but sell it in its fullest sense. That is, have the equipment, the repairmen and the system that will so sell your service in spring overhauling that your service work will be benefited thereby ever after.

There is in every truth more to be gained out of spring overhauling than the bare jobs themselves. It also paves the way to the sale of more accessories. In fact, it makes almost simultaneous the sale of accessories and service.

Take this example for instance of how this comes about.

A man brings in his car to be overhauled. Among other items of possibilities there is the spark plug sale. Suppose this man has on his car spark plugs that saw 5000 or even 8000 miles' service last year. With cleaning those plugs might do, but there is every likelihood that the man is open to suggestion. You, as the expert in charge of putting his car into such a condition that it will give him as nearly perfect service as possible, are in a position to give advice, and the chances are that nine times out of ten that advice will be accepted. The tenth time the owner usually has a grouch on.

New Spark Plugs

You may suggest he start the new season with a new set of spark plugs. And there you are.

Unduly worn parts always should be replaced, of course.

This year offers unusual opportunities, moreover, in the sale of accessories. The touring season is opening earlier than usual. More motorists are going on trips overland than for several years. In fact, this year may see a new record in touring, both for long-distance and shorter trips. Every accessory that makes such trips more comfortable is in for its inning. Camping equipment of all kinds, as well as such staples as spark plugs, bumpers, spotlights and so on, will sell very readily. But more of that later. The thing you want to do now is get the spring overhauling work in your shop at the time most convenient to you, when you are best able to handle it. Naturally, the more you get the better for your service account.

It is highly probable that if you use an advertisement such as that suggested or send out letters to a list more extensive than your regular customers, you are going to get in a new lot of trade. You are going to extend your service. If you are a dealer, with a repairshop supplementary to your sales end, you are going to get a chance to make more out of that supplementary department—if you sell service. If you are a service station operator or garageman, you are going to grow this spring like the proverbial green bayberry tree.

What is true of cars is true of trucks and tractors also. All need overhauling once a year, and now is the time for you to go after the job.

Don't forget either the cars that were laid up on account of the war and which now are going to be brought out and put into shape.

During this spring overhauling period you might do what one dealer in the South did. He made arrangements for an expert from the factory to come down to his town. This expert was a man who not only knew the car from A to Z as to its makeup but exactly how the carbureter should be set, how fast the car should be able to travel in certain positions of the speed lever, in how many feet it should pick up to 30 m.p.h. from a standing start and so on.

Just before the expert arrived the dealer wrote to his clients.

"Spring Has Came"

That's what the "boys" in our shop say, jokingly, the day that you, along with Tom, Dick and Harry and most everyone else in town, bring your cars here and want them all fixed up that day.

It simply can't be done. Please don't make it necessary for us to say that to you. Help us by helping yourself.

Bring your car here to-day instead of next month. Then we can have time to do a real overhauling job for you. And we'll do it right.

Bring in Your Car—We'll Do the Rest

Mayo Bros. Garage
112 Francisco Street

"Mr. Expert is going to be here two weeks," he told them. "Bring in your cars and see how they stack up."

Owners flocked to the dealer's place of business. Some of them were surprised when told their brakes were dragging, transmission shafts out of line, steering gear too loose, ammeter not showing enough charge—but they were glad to know it.

The expert gave each owner a tag showing the item thought necessary to put the car in the shape the factory intended it should be in.

The dealer got the repair work or adjustment. He should have. The service for having the car tested was free. But the dealer was more than repaid. Both in confidence and in increased business. He "sold" his service forever in that community. And, incidentally, he's going to have to keep a mighty good trouble shooter to live up to his reputation.

Now, all the dealers and garagemen in the country couldn't do this. In the first place, the factories couldn't spare the experts right now to go out to every dealer. But there's more than one way to kill a cat or run a garage.

Have a man from your own organization do the testing. Write your letters. Set a day or days when owners can get this service. Then watch the results. Take it from the southern dealer's experience, you won't have to wait long.

Let your service manager be the expert. Often your service manager is better even than a factory expert in a case of this kind. While the factory expert may be well acquainted with the components that go into the car's makeup, he does not get so closely in touch with the car after it gets into the hands of the owner.

As a dealer, you no doubt are aware of the troubles that cars of the same model or the same make may have in common. Therefore, you would know what to look for in shooting troubles.

But whatever you do, do not overlook the fact that springtime—April—is the great fitting-out time for cars. Spring overhauling plus spring fittings bring prosperity, and the dealer or garageman who is aware of this fact profits thereby.

Mayo Brothers Garage

Expert Repairing

Academic, Ohio, March 27, 1919.

Mr. Joseph P. McNulty,
231 West Front Street,
City.

Dear Mr. McNulty:-

The spring and summer motoring season is almost here. We presume that your car has had little mechanical attention since last season.

You realize that it is an economy to have your motor car put in first-class condition once a year.

We are prepared to do the necessary work on your car and would like to do it now, if you please. You must realize the folly of delaying such work until you need the car daily. We can assure you a better job, too, if we can start it now before the rush of general business starts in the spring.

Won't you come in tomorrow, Mr. McNulty, and let us discuss this proposal of ours? Your immediate attention will be appreciated.

Very truly yours,

Mayo Bros. Garage
By.....

NO CUT-OUTS HERE

Indianapolis, Ind., March 21—The Indiana senate has passed the anti-muffler bill, making it unlawful for the driver or owner of a gasoline-propelled vehicle to use it without a muffler and forbidding the use of a cut-out. A fine of from $10 to $100 is provided.

Through a bill introduced by Senator McCray, of Indianapolis, the motorists are making war on the activities of the justices of peace. The bill provides the limiting of the jurisdiction of the justices, permitting them to hold a preliminary hearing of cases pertaining to the motor vehicle laws and giving them the authority only to bind the accused over to the circuit court for trial.

EXCESSIVE TRUCK LOADS

Columbus, Ohio, March 22—The Ohio legislature is preparing a law levying heavy penalties on motor truck owners who carry excessive loads and who travel at an excessive speed over Ohio highways. A draft of a proposed law is now before the highway committee of the state senate.

Ohio has a law limiting the weight of trucks and loads to 12 tons. The highway committee has been informed that this law is not being observed. While considering the maintenance of highways by a patrol system, the legislature will also take up the question of putting teeth in the present law against excess loads and speed.

BOUGHT STOLEN CARS; PRISON

Flint, Mich., March 21—C. H. Lintz, Flint dealer convicted of buying stolen cars from an organized gang of Detroit thieves, has been denied a pardon by Governor Sleeper and is now doing time in Ionia prison.

TANKS AT ARSENAL

Rock Island, Ill., March 22—The Rock Island arsenal is to be made headquarters for war tanks. It has been decided to make a tank corps a permanent adjunct to the army. The caterpillar tractors which proved such a success in winning the war will be armored and repaired at the arsenal.

The tanks, which were sent to France, will be shipped home as rapidly as possible and will be overhauled and placed in first-class condition. A force of highly-skilled operators and mechanics will be trained, and it is hoped to make the tank department one of the most efficient of the Army.

IOWA BUYING TRUCKS

Des Moines, Iowa, March 21—"I am more than pleased over the prospects in the West for the motor truck," says Arthur E. Custer, treasurer of the Commercial Car Unit Co., Philadelphia, Pa., who is making his first trip west. "Things are slow and more or less unsatisfactory in the east and I came out here to see and to judge for myself as to western conditions. I am more than pleased. The motor truck has a great future in the West and already there are indications that the time is at hand when big business will be done.

"The West is rich, tremendously rich, and the farmers are going to buy motor trucks. Now that good roads projects are under way, projects which will be pushed to completion, there is no limit to the motor truck possibilities. I am going back home convinced of this and am going to get ready for it."

This sentiment is corroborated by the local branch of the International Harvester Co. The manager says that there is certain to be a big demand for motor trucks in Iowa this year, and his specifications for stock exceeded those of last year by more than 200 per cent.

Lack of Parts Slows Car Production

Sales Departments Are Thirty to Ninety Days Ahead of Deliveries

DETROIT, March 22—Curtailment of production of the parts that go into the makeup of cars, due to the iron and steel market, is acting directly on the production of cars, which is not expected to reach normal until the iron and steel market is stabilized and expected price reductions materialize.

The slowness in settling war contracts also is affecting production in general. Here again the parts maker is hit hardest. He cannot collect from the companies he supplies because the companies have not been paid by the Government. Most of the concerns are ready for peacetime production, however, and the demand for cars is ready. Nearly every sales department is from thirty to ninety days ahead of production.

Car production in February was nearly double that of January, and March production is expected to show an increase of from 10 to 40 per cent.

Among the companies increasing production despite the curtailment in production of parts is Hupmobile. This concern now is running sixty-five cars daily. This is an increase of ten cars a day over February production.

The J. C. Wilson Co. has concluded its Government contract and is back to peacetime work. The last group of Government trucks was shipped direct to the postmasters at York, Pa., and Columbus, Ohio, which bears out the general belief that the War Department is going to turn many of its surplus machines over to other Government departments.

The Prudden Wheel Co., Lansing, is back at 100 per cent production, although at the time of the armistice it was 100 per cent on war work. It is employing 1110 workers now. About $60,000 worth of special machinery used in Government work has been returned to the Ordnance Department and the concern practically has made final settlement with the Government for $750,000 invested in canceled war contracts.

G. M. BUYS INTER-STATE

Muncie, Ind., March 22—General Motors has bought the fiscal property of the Inter-State Motor Co., including the plant and 40 acres of land adjoining it. It is expected this property will not be used for the manufacture or assembly of cars, but of parts, although the plant readily would lend itself either to the manufacture or assembly of cars or the building of bodies. However, there is no doubt that with the plant and adjoining property General Motors has acquired the nucleus of another large unit of its vast activities. This also is taken to mean that there will be no more Inter-State cars and that the company automatically will cease to do business.

The Inter-State company was one of the first to discontinue the manufacture of cars for the duration of the war early in 1918. It was announced at that time that the company would place on the market 1- and 1½-ton trucks instead. However, during the war the company took on contracts for artillery tractors and had only tooled up for production when the armistice was signed. As a result, peace found it totally unprepared to resume commercial work and it notified its distributers and dealers that they should not depend on deliveries for several months to come. It was expected then, however, that when the company had completed the 15 or 20 percent of the Government orders which it planned to do and re-converted the plant back to cars, a much improved car would be marketed.

TO MAKE HOLLIER SIX

Detroit, March 21—The Lewis Spring & Axle Co., Chelsea, Mich., maker of the Hollier, will bring out a six-cylinder car in about two weeks. Before the end of April this company also will place a commercial airplane on the market, to be called the Lewis Special. The first is about complete. It is equipped with a Hall-Scott engine and is said to make 100 m.p.h. Airplane production will be a side issue, however, as the company will devote most of its attention to the Hollier-six.

Ninety per cent of the new car will be manufactured at the plant. It is a five-passenger with 116-in. wheelbase, six-cylinder Red Seal Continental engine. The price will be $1,785.

The company has added a new spring department to its manufacturing facilities and is now making its own springs as well as preparing to cater to outside trade.

COFFIN ON WAY HOME

Paris, March 1—By mail—Howard E. Coffin is leaving Paris this week for New York via England. Mr. Coffin has been on this side for the last three months and has traveled extensively in England, France, Italy and occupied portions of German territory. Continuing the work of the Council of National Defense, Mr. Coffin has been particularly interested while in Europe in everything concerning aviation development and particularly the role which America will play in the coming conference to decide on international agreements regarding air navigation.

It is understood Mr. Coffin will spend but a short time in America to attend to private business and then will return to Paris.

WOLVERINE REORGANIZES

Kalamazoo, Mich., March 24—The Wolverine Motor Car Co., whose plant has been idle since 1917, has been re-organized and has resumed operation. The new company proposes to manufacture 600 cars this year, and the first machines are now in process of production. The Wolverine will be made in three models, a roadster to sell for $3,500 and four- and six-passenger touring cars to sell at $3,750. A four-cylinder Duesenburg engine is used in all.

The company is making its own bodies, fenders, gas tanks and many smaller parts. Only one or two departments of the present plant is now in operation, but the rest will be started as soon as the production increases. The company proposes to build a new factory building this year.

The officers of the re-organized company are: President, A. H. Collins; vice-president and chief engineer, Harry A. Scott; secretary, W. H. Scott; treasurer, C. M. Bush.

HOW IOWA DOES IT

Des Moines, Iowa, March 21—When the Motor Trades Bureau of the Des Moines Chamber of Commerce has a meeting it draws a crowd somewhat in this way. Take, for instance, the postponed monthly meeting which will be held Monday night.

One letter of invitation was sent to thirty motor bureaus of chambers of commerce in Iowa towns. This called attention to the assistance given in the organization of various motor trades bureaus and extended the glad hand to dealers and garagemen to attend the Des Moines dinner. Another went to 300 Iowa dealers direct.

Harry G. Moock, secretary and business manager of the N. A. D. A., and Maj. W. J. Barndollar, chief of a motor transport base in France and formerly with the Schee company on the Des Moines row, are the speakers for Monday night.

STATE'S TRACTORS TO GO

Harrisburg, Pa., March 21—Twenty-three tractors purchased by the State Defense Commission last spring to aid the farmers in plowing have been turned over to the state highway department to be used to drag roads. This step has been taken by Frank B. McClain, executive director of the commission. He also has turned over twelve state-owned tractors, with plow attachments, to state institutions for use on farms. The remainder of the implements will be sold.

This means the tractor-leasing proposition was all very well last spring to speed up the crops for war purposes, but there has been so little general response to another year of leasing the state's tractors the idea was abandoned.

LEE LEAVES FORD PLANT

Detroit, March 21—John R. Lee is the latest big Ford official to resign from the Ford Motor Co. organization. His resignation came Thursday following closely that of Harold Wills, chief engineer and production head, who severed his connections earlier in the week. Mr. Lee has not made known his future plans but probably will remain in the automotive industry, he states.

Ever since Norval A. Hawkins, sales engineer, quit the Ford company several weeks ago, automotive circles have been full of rumors concerning administration changes, the Ford organization has been seriously shaken, it is said.

John R. Lee was the man who worked out the profit-sharing and wage-adjustment policy of the company. He was also the

head of the sociological work which attracted the attention of manufacturers and large employers of labor everywhere. When this country entered the war, Mr. Lee represented the company at Washington. He was a member of the Automotive Industries Committee created to represent the motor industry and to assist both the Government and the manufacturers in placing and executing ammunition contracts. He was with the Ford Motor Co. eight years.

FIRESTONE WITH NEW TIRE

Akron, Ohio, March 21—R. J. Firestone, vice-president of the Firestone Tire & Rubber Co., is instrumental in the organization of a new rubber company. The company has acquired the property of the Standard Tire & Rubber Mfg. Co. at Willoughby. Mr. Firestone will be president. Other officers are: Vice-president, C. A. McCulloch; treasurer, T. A. Palmer. Pneumatic and cord tires will be manufactured. The plant has a capacity of 250 tires a day.

AVERY MANAGERS MEET

Peoria, Ill., March 21—Branch managers of the Avery Co. meeting here in the annual sales conference reported that crop and business conditions are better than normal and that farmers are ready prospects. Two days were given over entirely to conferences of the managers and officers, in which merchandising and service were covered thoroughly. About seventy-five attended the banquet, at which miniature Avery tractors, 3 in. high and of cast iron, were the favors.

INCREASE IN CAR SALES

Seattle, Wash., March 21—The following table is interesting in that it shows the increase in the sale of cars in British Columbia:

	1916	1917	1918
Ford	596	1501	1771
McLaughlin	171	399	478
Chevrolet	167	310	437
Overland	79	174	288
Dodge Brothers	59	122	143
Studebaker	55	111	130
Chalmers	20	37	62
Cadillac	14	26	19
Saxon	14	15	39
Hudson	11	27	16
Maxwell	..	67	121
Gray-Dort	..	43	90
Briscoe	..	27	58
Franklin	..	12	16
Totals	1186	2871	3668

MANLY RESIGNS FROM CURTISS

Buffalo, N. Y., March 21—C. M. Manly, chief experimental engineer of Curtiss and president of the S. A. E., has resigned from his position with Curtiss and will return to New York for the continuance of his private engineering business. He will be actively concerned with his hydraulic drive, which recently has been found successful in large marine installations.

VINTON LEAVES NATIONAL

Indianapolis, Ind., March 22—A. E. Vinton, with the National Motor Car and Vehicle Corp. for the last dozen years as assistant sales manager and lately as manager of the export business, has been appointed general sales manager of the New Jersey Car Spring & Rubber Co., Jersey City, N. J.

Sarles Wins Ascot at 70.62 M. P. H.

Race Only One Week Later Than Santa Monica Shows Interest Keen

LOS ANGELES, Cal., March 23—Special telegram—This was record-breaking day at Ascot speedway. The fastest field of cars the track has known competed; a new track time was set, and it was the largest crowd at any race of this territory, 50,000 persons viewing the event from bleachers, telephone poles, housetops, a 200-ft. water tower and even airplanes.

In short, to sum up all the records, if the Santa Monica road race of a week ago and Ascot to-day can be taken as a criterion, there is every reason to believe racing this year will attract more interest than ever before.

Roscoe Sarles won to-day's event in the Roamer Special, turning off the 150 miles in 2:7:2, or a time of 70.62 m.p.h., and a new track record. Hearne in a Chevrolet was second; Pullen in a Hudson, third; and Durant in a Chevrolet, fourth. Toft and Lewis were still going at the end, but Lecocq, Elliott and Thomas had been eliminated by mechanical trouble.

There were no accidents. Sarles drove a good race, having to fight for the victory, as three stops for tires forced him back. He was using retreaded tires for a time and the scenery was somewhat littered with them, but he finally drew some good ones.

Sarles first went out when leading in the twenty-sixth lap. In the fortieth, when in third place with Hearne leading, he again had to stop but did not lose his position this time. He was out again in the seventy-third, when Pullen headed the field. At 100 miles he was third and at 130, second, with Pullen first, Hearne having to change tires. At 140 miles Sarles regained the lead and held it to the finish, Pullen having slipped back.

De Palma had intended to try for the track record but in practice yesterday he damaged his steering gear, so to-day he only drove a 5-mile exhibition, averaging 75 m.p.h.

Josef Christiaens

JOSEF CHRISTIAENS, who twice raced in this country and who was to race again in the Indianapolis event May 31, is dead, killed while testing out one of the Sunbeams for the 500-mile sweepstakes. The accident occurred Feb. 25 at Wolverhampton. Frank Bill, the Englishman who rode with Christiaens on his visits to America, was in the car also but escaped injury and will come to this country with the Sunbeams. Christiaens pulled out too far to the side of the road and the car turned turtle.

BARNEY CAN DRIVE FOR $1,000

New York, March 21—The Contest Board of the American Automobile Association has reconsidered the suspension of Barney Oldfield for non-sanctioned driving and has substituted a fine of $1,000. So Barney can "come back" again if he wants to.

ACCESSORY MEN MEET

Detroit, March 21—The annual meeting of the Automobile Accessories Branch of the National Hardware Association was more of a convention of accessory manufacturers than jobbers. More than 300 were present and most of these represented factory organizations. It was a rare opportunity for the dealer and the maker of accessories to get together and they got together on many vital points, chief of which was on prices and price cutting.

The first annual accessory show of the organization was held. While it was not as large as other accessory shows, it was a good beginning. The show will be a regular feature hereafter.

The two days of the meeting were crammed full of addresses and discussions. The program called for twenty-eight addresses and discussions, two open forum hours and a big informal dinner-smoker at which all the salient points were dug up and discussed all over again.

The manufacturers centered their effort in convincing the hardware men that the hardware store was the logical place to handle accessories and they went the limit in urging the dealers not only to handle accessories but to push their sale to a greater degree than they have been doing. On the price question, the convention took a definite stand against the "price cutter" and as a result the man who "undersells" the market is going to find it harder going in the future than in the past.

OLD JOBS FOR SOLDIERS

Denver, Col., March 21—The Rocky Mountain Auto Trades Association has unanimously agreed to offer its facilities to the furtherment of securing employment for returned soldiers. The employment bureau has been opened to any firm who may desire to employ applicants registered therein, although this regularly is operated exclusively for the benefit of members.

EDITORIAL

Factory Co-operation

DEALERS often express a feeling that the manufacturers do not give sufficient weight to suggestions from their sales organizations and thereby make sales and service harder for both the factory and the dealer. They feel that too little attention is paid by the engineering and designing department of the motor car factories to suggestions from the distribution end of the business. It is not often that the designing department forgets that the distributers' and dealers' suggestions reflect the ideas of the owners. Most frequently there are production and material difficulties which prevent practical carrying out of the suggestions but which the factory does not take the trouble to explain to its dealers.

IT is not uncommon, also, that the dealers themselves are not a unit as to what they want. Demand for a certain feature in one territory sometimes is counteracted by a directly opposite opinion as reflected by the local needs of another section. Successful co-operation between manufacturing and distribution departments requires some means by which the factory may get the benefit of the dealers' and distributers' first-hand information as to the needs of their territory and at the same time let the dealers understand that their suggestions are given thorough consideration.

IN a sales conference held last week at a factory which has a comparatively small number of distributers, each representing a large number of dealers, this result was obtained. A feature of the three-day meeting was a series of round-table conferences in which the distributers got together with the representatives of all the different departments of the factory to thresh out the pros and cons of all suggestions in open meeting.

EACH distributer was called on in turn to give his ideas on the point under discussion—say, the color of the wheels—and when the distributers themselves did not agree the meeting was turned over to them until they decided what they did want. If what they wanted was not feasible from a factory standpoint, they were told frankly why it was not feasible. As a result when the distributers left town they carried back to their territory a full appreciation of the desire of the factory officials to co-operate with them and the feeling that any suggestions they might make would be given consideration, at least.

A Vision in Service

IS it not possible some day soon, when tractors become as numerous as motor cars, dealers and garagemen will have the farmers bring them into the town and city garages in spare seasons and have them gone over and got in ship-shape condition for the next rush of work?

IS is not quite within the range of possibility that the up-to-the-minute tractor dealer will have a couple of service wagons? One will be perhaps a light car chassis with a useful working body on it. With it he can go in response to a farmer's telephone and drive right into the field where a job is to be repaired. He can carry spares, tools and perhaps a demountable derrick by which he can lift the end of the tractor to make a repair easier or lift the engine out if necessary to do a repair.

WILL not some enterprising dealers have a motorcycle sidecar in which the repairman can make a quick cheap trip to any farmer within a 30-mile radius? He can carry enough tools to make many repairs. He can carry small repairs. The job will not cost the farmer so much as if it were made in a car or light truck. It will not take so much time.

SOME tractor dealer with a big distribution and a lot of tractors in operation in the country will fit up a ton or heavier truck as a mobile repairshop. He will have a small lathe on it. It will contain a drill press, perhaps a welding outfit and an engine repair stand. With such it will be possible to take an engine out of the tractor and do any repair job needed on the bearings or other parts. There will be equipment for carbon removal and a full quota of tools.

WITH farmers all provided with telephones it will be possible for the repairshop to keep in constant touch with such a mobile repairshop and direct it from farmer to farmer as needed.

THERE is no thought here of moving the repairshop of the town onto a truck and running it all over the country. No. The only thought is more efficient service. Service that can be made to make money for the dealer as well as the farmer.

SERVICE is growing in many ways that would not have been deemed feasible a few years ago. Each season writes a new chapter in the romance of service for automotive apparatus. Look at the ignition repairman in Minneapolis, or in Kansas City or in Omaha who specializes on such. He repairs for all sections of his territory. Every morning parcel post packages bring new jobs, and each evening other parcel post packages carry repaired jobs back to the waiting owner. Tens of thousands of such jobs have been done by one company in a single year.

ANOTHER man has conceived the idea of being a traveling magneto expert for tractors. He has spare magnetos, and when a farmer 'phones him he hurries off in his little car with a few spare magnetos, places one of his good jobs on the tractor, charges a rent for it and takes the disabled one to his shop to be repaired.

THE SURFACE of possibilities has not been scratched. It is not all visible. Sit down and dream dreams of possible service. Dream dreams of tractor service that will save the time of the farmer. Service that will keep his tractor spick and span. Service that will be cheaper than present service but which will bring more money to the dealer and more love between the farmer and the dealer.

How *Not* to Sell Tractors

This May Be Other Than a Gentle Hint, but You Be the Wise and Let It Be Sufficient

By Fred M. Loomis
Motor Age Editorial Staff

THERE is a certain old-timer retail implement dealer about 100 miles west of Kansas City—never mind what his name is—who has been trying the tractor business for the last year with conspicuous ill-success.

There's a reason.

He has been making a bluff at selling a tractor of well-known make—never mind the name of that, either—which is one of the most popular and easily sold of all the tractors now on the market.

This particular tractor dealer came to the tractor show at Kansas City, although the Lord only knows why he did so, for upon his own admission he is heartily sick of the tractor business and thinks he will not stay in it very much longer.

Again, there's a reason.

Always Able to Talk

Talk? Yes, he was entirely willing to talk, and what he had to say was sufficiently enlightening as to why he never had made a success of the tractor business and as to why he never would. And the pity of it is that there are others just like him. As a typical example of this class of dealers who do not know how to conduct a tractor business, this particular chap is a prize package.

Fundamentally, the trouble seems to be that he refuses to catch up with the procession—he is lagging hopelessly behind. He cannot or will not see that a new order of things is at hand, and he stubbornly insists upon trying to do a tractor business along identically the same lines he has been accustomed to follow in his implement business, all unconscious, apparently, that even in the implement business his methods are utterly antiquated and discreditable.

Take the matter of service and the carrying of a stock of spares, for instance. This dealer absolutely refuses to carry a stock of repair parts. Why? Because tractor repairs are always shipped C. O. D. and he doesn't intend to invest any of his good money in dead stock! Always in the past his implement manufacturer or jobber has carried his stock of repairs for him and if tractor manufacturers cannot do the same thing then it is their fault and not his if one of his tractor customers has to wait!

Well, what if he does have to wait? That won't hurt him any. It's only 100 miles to Kansas City and under ordinary circumstances it takes only 24 hr. to get a repair out. A little delay like 24 hr. shouldn't worry the farmer any, no matter how great the need. Service which brings a part in 24 hr. always has been plenty good enough in the regular implement business and it ought to be good enough in the tractor business.

Then, there's this matter of cash. This dealer objects most strenuously to putting up a partial payment as a deposit to hold his quota or to paying in full for the tractor upon its delivery. Why, no implement manufacturer ever exacted anything like that! Always he had been able to buy regular goods on regular terms and whenever anything new and special, like a tractor, came along, the manufacturer was only too glad to put it into his hands and wait for his pay until the new things were sold. To have to pay for a tractor upon receipt was all nonsense, all wrong, and as long as tractor manufacturers insisted upon doing business in that way they needn't expect him to grow very enthusiastic over the tractor business.

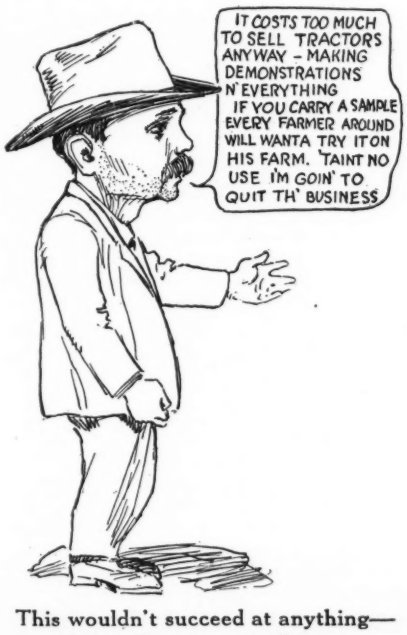
Samples Mean Work!

Anyway, carrying a sample tractor in stock is more a detriment than an advantage, according to his way of looking at things. If the dealer has a tractor in stock the farmer is certain to want to take the machine out to his farm to try. If it suits and does his work as he thinks it ought to, then he will come in and make settlement. But if it doesn't happen to suit, then he will bring it back. You see, the farmer has been trained to ask for such things in the implement business because it has been a time-honored custom for some implement dealers to send goods out on approval, and the farmer expects the custom to continue. Now, if the dealer doesn't have a tractor on hand the farmer can't ask to take it out and try it. If he buys, then the machine can be ordered in and delivered to him and there can't be any comeback. For this reason, it's poor policy for the dealer to have a sample around the place, according to our friend.

Finally it costs too much to sell tractors. Covering time, travel and demonstration, the cost of selling a $1,500 tractor is about $50, all incurred before the sale is consummated. To this must be added what it costs to deliver and instruct the farmer in the operation of the machine. This overhead is too high, and the dealer cannot afford to put in his time trying to sell tractors on any such basis. Of course, by contracting for more machines he could get a larger discount and have a wider margin of profit, but not this dealer; he didn't intend to tie himself up and take any chances. Not even to do business.

Should Get Out

About the only right thing this dealer is thinking of doing in connection with the tractor business is to get out of it. He'd be a lot better off, and so would the tractor trade. Another dealer at the Kansas City show, one who has been as conspicuously successful as this one has been unsuccessful, and in almost the same neighborhood, said the most serious problem the tractor dealer had to encounter was the competition of men who got into the tractor business who did not know how to handle it and succeeded merely in demoralizing the trade for those who did. This man is an example of the sort of thing the second dealer objected to. He does about all the things one ought not to do and hardly any of the things one ought to do in selling tractors. It is no wonder he has not succeeded—it is impossible that he could.


IT COSTS TOO MUCH TO SELL TRACTORS ANYWAY - MAKING DEMONSTRATIONS N' EVERYTHING IF YOU CARRY A SAMPLE EVERY FARMER AROUND WILL WANTA TRY IT ON HIS FARM. 'TAINT NO USE I'M GOIN' TO QUIT TH' BUSINESS

This wouldn't succeed at anything—he's a "taint no use" man

I WONT INVEST ANY OF MY MONEY IN A DEAD STOCK OF REPAIR PARTS LET THE FARMER WAIT A FEW DAYS AND WRITE TO THE FACTORY IT WONT HURT HIM

This one believes in letting the mountain do the traveling—it won't

Texas Levies Tax on Highway Trucks

Requires Garages to Keep Descriptions of Persons Having Repairs Made

AUSTIN, Tex., March 22—The Texas legislature, which has just ended its session, enacted several new laws affecting motor vehicles in the state. Most of these are directly beneficial to owners, but one levies a special tax on trucks hauling freight upon the public highways.

This special tax law provides that any person, firm or corporation operating a truck on the public highways, for public or private use, to transport freight shall register the truck with the commissioner's court of the county in which the truck operates and secure a permit to use the highways. The commissioner's court is authorized to levy and collect a fee, not to exceed ½ cent a mile, based on gross receipts, mileage and tonnage of the truck. Revenues derived from this source are to go to the road and bridge fund of the county in which collected.

Another new law is intended to make the location and recovery of stolen cars less difficult. It provides that it shall be unlawful for any person to operate upon the public highways a car the engine number of which has been defaced. Provisions for the protection of innocent purchasers now without engine numbers are made in a section of the law which permits them, with proper explanation as to how the car came into their possession, to obtain a new engine number from the highway commission.

Amends Garage Laws

Another measure along the same line amends the law as to garages and repair-shops. This amendment will require that a personal description of the person having repairs made be entered upon the register. It is hoped this amendment will help in breaking up gangs of professional thieves. While this measure was under discussion in the house it was stated 10,000 cars are stolen in Texas every year, and that inter-state traffic in stolen cars has become very heavy.

Still another law along the same subject provides that when a person gives a mortgage on a car he must keep the holder of the mortgage informed as to the whereabouts of the car. A penalty for giving wrong information is provided.

A pure gasoline law, which requires that the products from petroleum shall meet the standard fixed by the state chemist, was passed also. Technical standards for every sort of oil used in internal combustion engines have been set by the state chemist, and the state pure drug department is charged with the enforcement of the law, which was drawn strictly in the interest of consumers of things included in the scope of the law. It also is provided that containers of fuel oils shall be marked with the name of the manufacturer and his address.

Another law, which places a gross production tax of 1½ per cent on all crude petroleum produced in the state, has been passed, and some are predicting it will cause a permanent advance in the price of petroleum products.

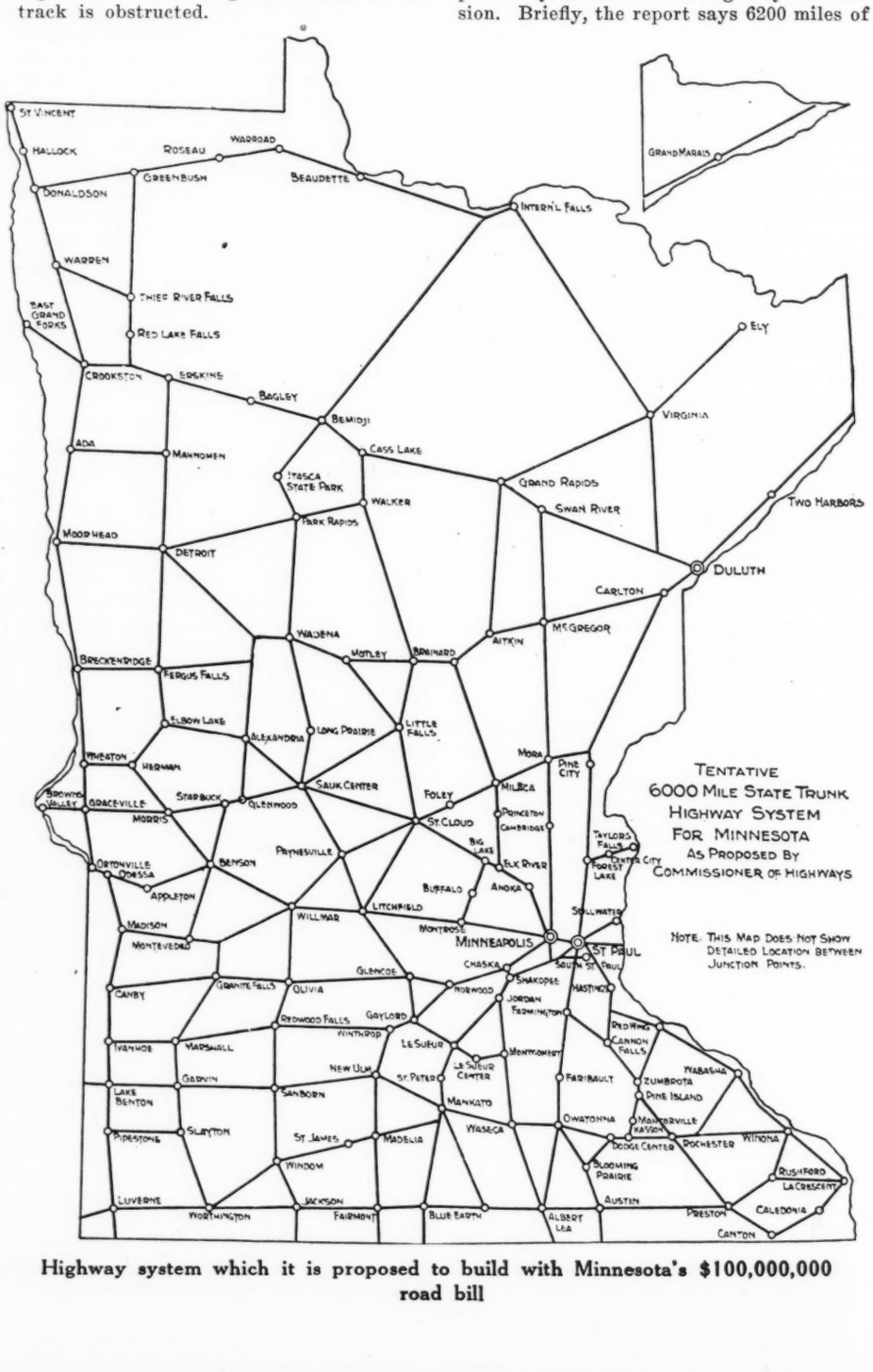
While the legislature made no change in the legal speed, it did provide for the employment of special officers to enforce traffic regulations. Commissioners' courts are authorized to employ one or more special officers to work under the direction of the sheriff in enforcement of traffic laws. These officers are to be paid out of the part of the special car tax which is retained by the county, and fines collected by their efforts are to go to the local road fund. The law also has a provision which requires all cars to come to a full stop when approaching a railroad crossing where view of the track is obstructed.

Another anti-thief law passed provides that any person engaged in the business of purchasing used cars or parts will be required to keep a register of all vehicles and parts bought with the trade number and engine number and a personal description of the person from whom they are purchased, unless the person selling is well known to the purchaser. In that case, his name and address is to be registered.

Under another new law garage companies are allowed to become incorporated. This law provides that jitney lines still remain under the control of municipal authorities.

ROAD WORK IN WISCONSIN

Milwaukee, Wis., March 21—A total expenditure of $27,950,000 for good roads in Wisconsin during the last two years is reported by the Wisconsin highway commission. Briefly, the report says 6200 miles of



Highway system which it is proposed to build with Minnesota's $100,000,000 road bill

state-aid roads were constructed at a cost of $20,500,000; a total of 4020 bridges, including 1497 state-aid and 2523 county-aid bridges, at a cost of $5,200,000; a total of $1,500,000 of Federal-aid construction and maintenance done; $750,000 expended in miscellaneous work.

The total mileage of roads graded, drained and surfaced is 5823. This includes 1277 miles of stone macadam, 1220 miles of gravel macadam, 254 miles of concrete, and 222 miles of miscellaneous surfacing. Fifty-one per cent of all highways built under supervision of the commission were completed by surfacing.

Milwaukee county is credited with the largest mileage of concrete roads, or 128.30 miles. Since the end of the period covered by the report this mileage has been increased to more than 155 miles. Outagamie county, of which Appleton is the seat, has 32 miles, and Kenosha county, 21 miles. In stone macadam surfacing, Dane county, of which Madison, the capital, is seat, leads with 110 miles. Sauk county is second with 88 miles, and Columbia, third, with 62 miles.

ROAD ENTERPRISE IN IOWA

Des Moines, Iowa, March 21—So insistent are the people of Sioux City, Iowa, for a constructive good roads law by the present Iowa legislature they took the entire membership of the legislature in a special train to Sioux City to see what has been accomplished there in the last few years in the way of hard-surfaced roads. All the main roads entering Sioux City are paved with a 16-ft. strip of concrete and the legislators were shown these roads, some of which had seen service for eight years and are in good condition. At the big good roads dinner in the evening business men told the legislators that they wanted a good roads bill "with teeth in it" which would permit the paving of every main highway in Woodbury county.

WOULD COMPEL PARTS STOCK

Lincoln, Neb., March 21—Nebraska is considering two bills which at least have novelty if they have nothing else to recommend them; but if they should be passed they would cause a lot of trouble.

The first of these is Nebraska S. F. No. 86. Under its terms every person selling farm tractors in Nebraska must carry within the confines of the state a stock of repair parts sufficient to keep such machines in repair. Failure to do so makes any selling transaction void. The same provisions cover sales of cars.

The other, which is styled Nebraska H. T. No. 85, provides for official tests of all tractors and would compel the maintenance of adequate service stations. According to the bill, every make and model of tractor offered for sale in the state must be examined and tested and passed upon by a board of three competent engineers under the control of state university management. Tests would be made of endurance, official rating of horsepower and fuel consumption per acre plowed. The bill also requires that an adequate stock of repair parts be carried, and failure to comply with the provisions bars offenders from doing further business in the state.

New England Is Tired But Happy

Boston Show Puts New Life Into Its Dealers—Changes in Row Personnel

BOSTON, Mass., March 22—When the doors closed on the seventeenth annual show of the Boston Automobile Dealers' Association to-night another successful exhibition was added to history. Tired and happy dealers scattered to the four corners of New England with orders, while factory officials went their way with contracts. The attendance was estimated at 235,000, a new record.

Some idea of the interest displayed in the show by visitors may be imagined when it is known that on Thursday night the doors had to be closed at 8:30 for a while because no more could get in and that some of the dealers who were out dining at hotels were unable to force their way through the throng to get back on the job.

On Friday night there was even a bigger jam. So thick did the crowd become that they swarmed clear across Huntington avenue from both doors and it was impossible for the street cars to use that thoroughfare. And the motor cars were stalled for blocks. Lines stretched from the entrance down along nearly to the Hotel Lenox. And it took about an hour for a person to work his way in. Manager C. I. Campbell had to arrange it so that the center door was closed to all visitors, and only exhibitors could enter there. A squad of soldiers guarded that door to prevent the crowd forcing its way in. Saturday night was practically a repetition of the two preceeding evenings. The war tax provision was a handicap in handling the crowds this year.

During the entire week there was but one entirely fair day, to-day, the first three days being rainy, while Thursday was cloudy, and Friday partly so. It was the bad weather of the first three days which caused the jam, for many postponed their visit, and then hundreds of them were disappointed at being unable to get into the building.

Striking a general average, not as many cars were sold this year as last. But the dealers were not surprised. Some of them did more business, others less. But they ran up into the hundred thousands.

Story Different Now

This year it is a different story from last year. Following the armistice, the dealers began to wake up. They put in their time and energy in preaching optimism and advertising in good shape. It had its effect. January and February of this year the dealers were doing the same business they ordinarily did in April and May. This had the effect of spreading the sales more evenly. It eased up the show demand. So when the exhibitors got going this year they found that while many more were interested in the cars than a year ago many of them were not quite ready to buy.

There were plenty of out-of-town dealers on the job. The total registration of dealers at the show this year was 2749, a few hundred more than last year. It was a good showing when one considers that many dealers in New England were dropping lines during the war while a lot more had been drafted.

Quite a few of the dealers presided over lines different from those handled a year ago. The Saxon was represented by Jean Falk, formerly factory man, and S. E. Baker, with Dodge Brothers a year ago. The Mercer was presented by F. J. Caldwell, who had been in the furniture business until a few months ago, when Fred Smith died and the agency changed. The Biddle was being sold by the de Rochmonts, who took it on a short time ago. John L. Judd had the Davis this year, while the Auburn that he sold last year was in F. E. Dutton's space, Empire man. The Liberty this year was in George Leghorn's space instead of the Hupmobile that was his line a year ago. The Hupmobile was looked after by Sherwood Hall, Jr., who two years or more ago was selling the Paige-Detroit. George Dunham, a year ago in the Stearns space, was presiding over the Standard eight this year, while Harry Dunn, formerly of New York, was looking after the Oldsmobile interests. Scripps-Booths were guided by Harry Dove, a former factory official, and David Virr, who was with one of the local sales companies, made his debut as a dealer with the Elgin. A. H. Sowers, who made such a success with the Jackson, was on the job with the Lexington.

Changes at Boston

A few changes were announced during the show. W. S. Jameson, who has been manager of the Paige-Detroit branch here for two years, has been promoted to the New York office. His place is taken by F. E. Skeetop. R. B. Greene, who had been with the Grant for several years, has joined the Paige forces. James E. Cowan, former Saxon dealer here, entered the show as manager of the Disteel wheel branch. Clarence Stowe and W. H. Haskell, Monogram managers, branched out as dealers, having bought an interest in the Lexington agency. R. W. Harris, formerly with Gray & Davis, has taken the Oldfield tire for New England with headquarters here. A new agency for the McNaull tire was placed with J. S. Loden and J. C. Threnheuser. D. B. Price, for some years with Firestone, announced his taking over the management of the New England branch of the Mason tires. W. S. Carleton, F. M. Broadhead and T. H. Morgan, three of the Republic tire men, announced the formation of a company to handle the Hewitt tires in New England. The Fisk Rubber Co. announced the division of its New England and New York territories with Walter Oakes in charge of the former and George T. Newton handling the other section. D. Janion MacNichol blossomed out as the owner of the Hood Tire Sales, distributing that output, and George Grow, the used car king, gave the public the first story of his buying a big plant at Canton, Mass., near Boston, where he will build the Grow tire. Frank S. Corlew, a former dealer, was at the show

as the New England manager of the Vulcan spring forces.

The big tire companies had headquarters at the hotels where they met their out-of-town dealers. A lot of accessory men also were on hand to talk to distributers.

There was the usual round of dinners, big and little. The big affairs were the Overland, the Maxwell-Chalmers, Nash, Cole and the Champion Ignition Co.

One feature of the week was a used car show, which was called a reconstructed car exhibition. George B. Cousins, who has been handling used lines with the Franklin as his leader, hired Horticultural Hall, spent $6,000 for decorations, advertising, music, etc., and put on a show. It was not in any sense a rival to the big show, however. The attendance was good and about all the cars were sold.

WARREN HOLDS FIFTH SHOW

Warren, Pa., March 21—The fifth annual show of the Warren Automobile Dealers' Association was held this week with about thirty makes of cars and trucks on display. Dealers with displays report an unusually promising outlook for the spring and summer trade of 1919 and an unusually large number of prospective buyers. There were indications show sales would break all records before the end of the week.

PARTS BY AIRPLANE

Wabash, Ind., March 22—The Service Motor Truck Co. has made arrangements for aerial distribution of parts throughout the country. The aerial service will be handled by the Service Aviation Training & Transportation Co., a separate concern formed by stockholders of the truck concern

Three pilots already have been obtained, and a 44-acre field has been prepared for landing. Hangars for the Curtiss planes, which will be used, are complete.

NEW DISCO SYSTEM

Detroit, March 22—The Disco Electric Mfg. Co. has brought out a new model which is simpler in construction than the older starting and lighting system for Fords. It is claimed that with the new model any mechanic can install the Disco in 2 or 3 hr. It is of two-unit construction, motor for starting and generator for charging the battery. The Detroit storage battery is used. At the same time the price has been reduced from $100 to $70.

W. H. PUTNAM DIES

Madison, Wis., March 21—W. H. Putnam, treasurer of the Madison-Kipp Corp. died in Milwaukee recently from pneumonia as the result of influenza. Mr. Putnam was one of the founders of the company, which is now one of the largest producers of force-feed lubricating systems in the world.

TRAINING FOR SERVICE

Des Moines, Iowa, March 21—That there should be a highly trained and competent service man, able to diagnose and cure all ordinary kinds of tractor troubles, at every point from which tractors are retailed, is the conviction of the sales department of the International Harvester Co. In pursuance of this idea the company has instituted a series of schools at the branch houses unusual in the tractor industry.

Some man, selected by the blockman from every town in which the company has a tractor sales contract, is brought to the distributing branch for that district. Selection may fall upon a man employed by the company's dealer, or he may be some local garageman or repairman. Essential requirements for selection are that he shall possess some mechanical aptitude, that he has some familiarity with automotive equipment and that he manifest a desire to perfect himself in a knowledge of tractors to render service on them.

He comes to the branch house at his own expense and receives a thorough course of instruction in the theory, design, construction and up-keep of I.H.C. tractors. He dismantles a tractor and re-assembles it completely. He is given a thorough course of instruction regarding the ignition, lubrication and care of all accessory parts. When he goes back to his dealer-employer, or to his own shop, he is a man thoroughly qualified to cope with all the ordinary ills likely to afflict the tractors in his locality. It is significant, too, that when he happens to be a garageman or repairman his acquired ability is at the disposal of the owners of tractors of any make, not being confined merely to I.H.C. tractors. The idea of the I.H.C. is to make competent tractor service men whether they confine their ultimate activities to I.H.C. machines or not.

GARAGEMEN AT SHOW

Harrisburg, Pa., March 21—The ninth and greatest show held in this city will close to-morrow. Eighty-seven cars are displayed in the Overland service station, and the decorations are so carefully designed the visitor would be unaware of the fact that the building was a service station if he did not know it.

As the Pennsylvania legislature is in session now the city is full of visitors from all parts of the state, and particularly from the districts in the surrounding countries, which is the very territory that the Harrisburg dealers sell cars to.

The accessory exhibits are numerous and attractive, and exhibits by several garages of samples of their work, with some of the equipment they have for service work, has proved of interest to the buying public and those who already own cars. This is the first time so many garages have seen fit to be represented at a show, and the interest seems to point to the fact that this class of exhibiter will increase at future shows both here and elsewhere.

The show was put on by the Harrisburg Motor Dealers' Association, of which George G. McFarland is president and J. Clyde Myton secretary and show manager. Trucks and tractors will occupy the building next week.

BRADLEY LEAVES M. & A. M. A.

New York, March 24—L. M. Bradley, who since October, 1916, has been manager of the Motor and Accessory Manufacturers' Association, has resigned. Early in December he was granted a three months' leave of absence because of illness and immediately went to Sea Breeze, Fla., where he is now.

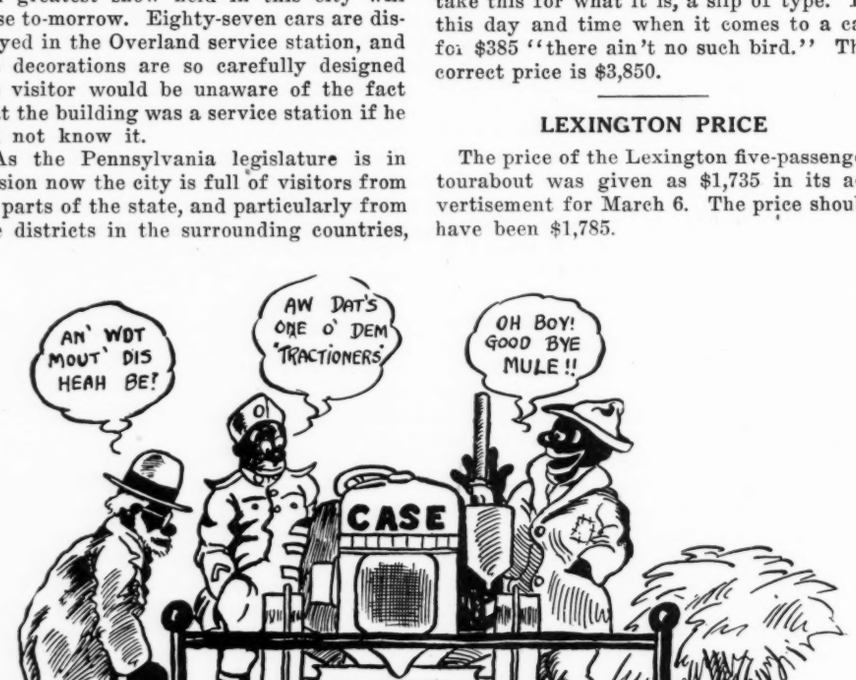
M. L. Hemingway, who was appointed assistant manager, has been appointed manager. Prior to his connection with the M. & A. M. A. he was with the Rubber Association of America.

REVERE IS $3,850

The price of the Revere car appeared as $385 in the passenger car tables for March 13, but naturally MOTOR AGE readers will take this for what it is, a slip of type. In this day and time when it comes to a car for $385 "there ain't no such bird." The correct price is $3,850.

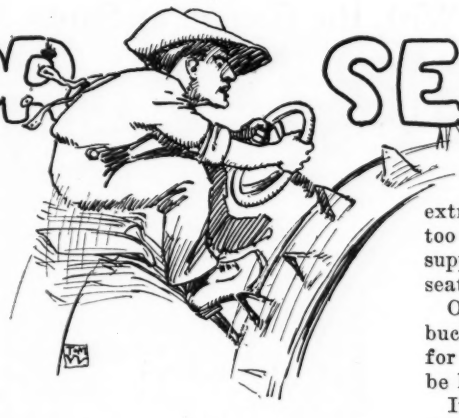
LEXINGTON PRICE

The price of the Lexington five-passenger tourabout was given as $1,735 in its advertisement for March 6. The price should have been $1,785.



Another incident from the tractor demonstration at Macon, Ga. Case had an electrically-operated cutaway tractor on display and the three shown were among the spectators. A Macon man made the sketch

TRACTOR SEATS



IF there is anywhere in a tractor wherein conservatism and the following of precedent are working a hardship to the operator, it is in the style of seats with which the majority of them are supplied. Seats fitted to most tractors are the same sheet-metal stamping that for years have been one of the answers to "Why do farmer boys leave home?" The chief virtue of this type of equipment is that it prevents the operator from going to sleep on the job. Scarcely anything less comfortable than the conventional tractor seat can be imagined.

In reality, the only practical reasons for the old type of seat handed down to us from the riding plows of our fathers is the fact that no condition of weather or usage can affect it. In answer to questions as to why something which at least gives an appearance of comfort might not be supplied in place of this relic of the inquisition, the information most booths at the Kansas City show offered was to the effect that tractor users left their machines out in all kinds of weather and no upholstering material would last.

The suggestion also was offered that farmers always had been used to this kind of a seat on their implements and might not take to a more luxurious fitting. Neither argument seems to be particularly valid but it seems that conditions which would render a good rugged type of upholstering valueless would be detrimental to other more delicate organisms of the tractors. There seems little reason why something cannot be developed which would provide less discomfort and yet be sufficiently practical for tractor use.

Remember the Straw?

Readers who have had the experience of sitting on a riding plow or cultivator for hours at a stretch remember the bags of straw with which they attempted to relieve the discomfort of the seat and how at the end of a furrow they would dismount and turn the bag over in a vain search for the soft side. Those who have had similar experience with the tractor seats, particularly when operating at higher speeds, know how uncomfortable they may become.

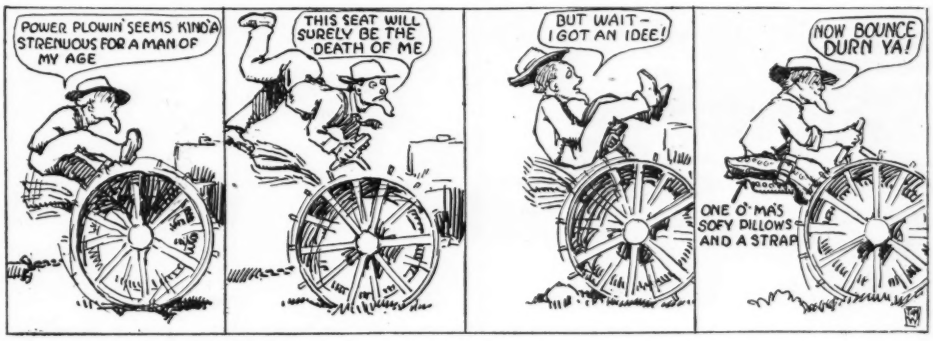
All this was brought about by the fact that four or five of the tractors exhibited at Kansas City recently showed that their designers realized the need of a more comfortable seat and are making attempts to provide them. Of all the tractors exhibited there were only these few in which there was evidence that any attempt had been made to improve on the old implement type of seat.

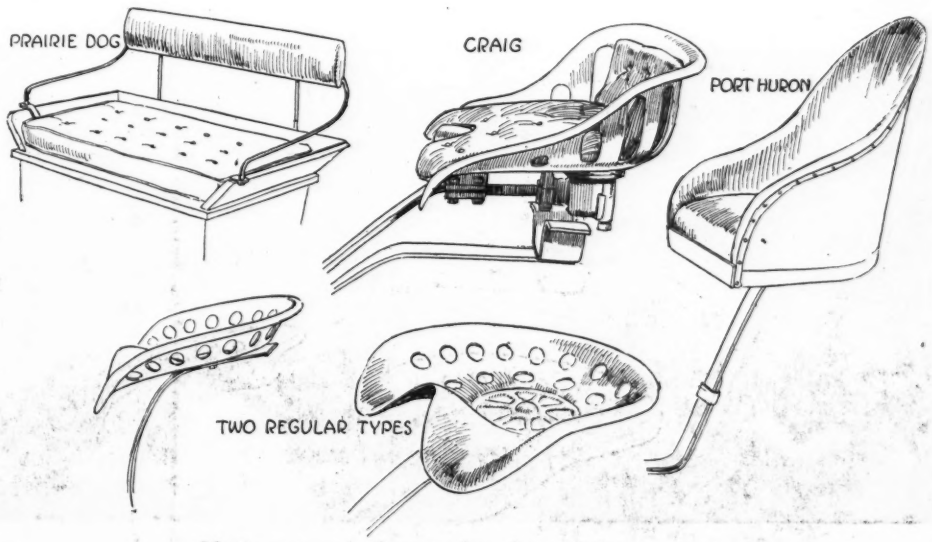
There were at least three in which a wooden seat provided with a cushion of leather or canvas and very much like the seat on a heavy motor truck was supplied. Usually these also made provision for a toolbox in connection, a feature in which most tractors seem to be sadly lacking. Holt has carried through into its farm tractors, along with several other features developed for military use, the standard truck type of seat provided on the ordnance artillery tractors. The Prairie Dog has a similar seat, with room for a toolbox underneath. The Nilson has a wooden seat for the driver and alongside of him a toolbox.

A seat in which the old sheet-metal type has been improved in shape and in mounting and provided with padding is found on the new Craig. This is a pressed-steel design rather deeper than the conventional type and provided with two pads, one on the seat and the other at the back. These pads are made of canvas and fit into the metal in such a way that they will not slip and at the same time are easily removable. The seat is mounted so it will give with any movement of the operator's body and is carried on a flexible support to give greater spring effect than with the normal mounting. To overcome this extra softness of the spring and prevent too great a movement, there is a second support, which comes into play when the seat is depressed over a few inches.

On the Port Huron a racing type of bucket seat is provided, sufficiently padded for comfort and with a back designed to be high enough to give some support.

It does not seem at all impracticable for seat cushions of some material to be provided which would absorb some of the jars and which at the same time would stand the hard usage they would get. A heavy oil-cloth covering would shed water as long as it lasted, and recovering would be an inexpensive matter.


POWER PLOWIN' SEEMS KINDA STRENUOUS FOR A MAN OF MY AGE
THIS SEAT WILL SURELY BE THE DEATH OF ME
BUT WAIT - I GOT AN IDEE!
NOW BOUNCE DURN YA!
ONE O' MA'S SOFY PILLOWS AND A STRAP



Various types of seats found on different tractors

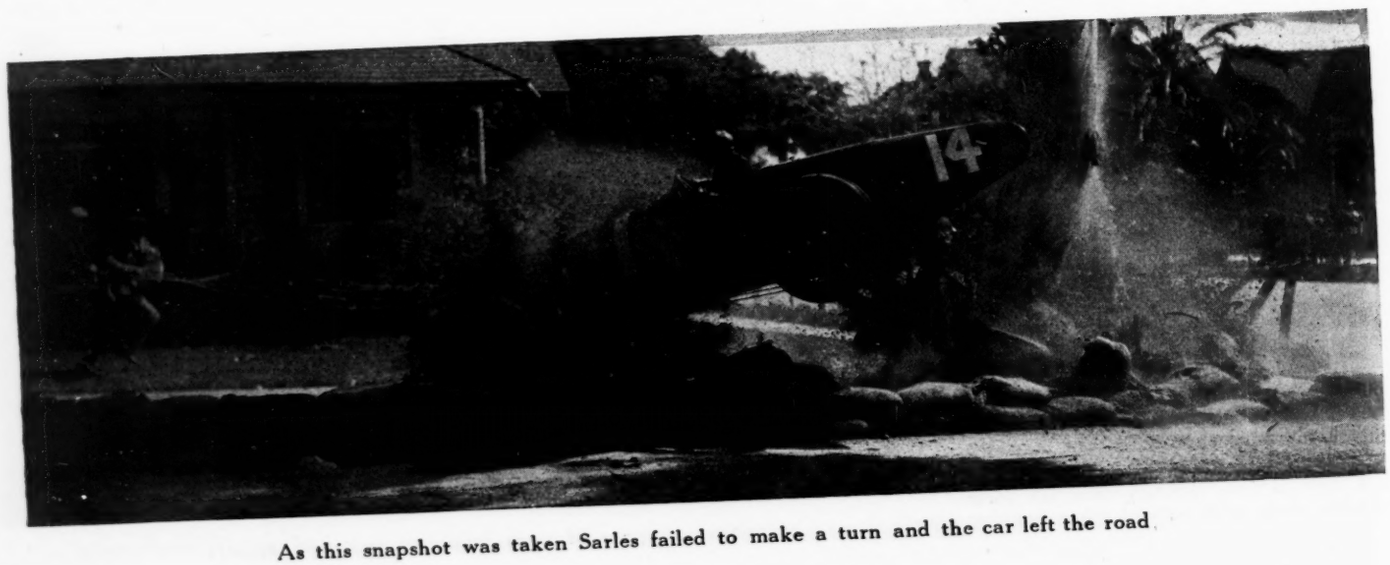
MAY SELL ARMY TRUCKS

Washington, March 21—In view of the decreased size of the Motor Transport Corps and the entire Army as provided for by proposed legislation, it is now considered possible that many war trucks may be sold. The National Automobile Chamber of Commerce already has informed the War Department it desires first knowledge of any proposed sales and the opportunity to work out some scheme whereby the manufacturer will be protected. The Motors Vehicle Section of the Army has assured the N. A. C. C. it will co-operate with the Industry.

With the Racers at Santa Monica

START AND FINISH
RICHFIELD
THE GASOLINE OF POWER
FIRST SECOND THIRD FOURTH
CAR No. 1 2 3 4 5 6 7 8 9 10 11 12 14 15 16 17
LAP No.
CHEVROLET

The line-up for the start of the Santa Monica and a brush on the right angle turn



As this snapshot was taken Sarles failed to make a turn and the car left the road

Dealers' Race Achieves Purpose

Los Angeles Trade Stirs Business—Frantic Scramble for Cars to Deliver Follows

LOS ANGELES, Cal., March 21—The revival of road racing on the Santa Monica course proved there is general interest in that branch of the sport in southern California, and any such interest as was reflected by an outpouring of 75,000 spectators is taken by the motor car trade in this city to indicate the public will recover quickly from its wartime depression. This race was planned and conducted in every detail by a committee representing the Motor Car Dealers' Association of the city and serves as an example of what can be accomplished in the way of stimulating a return to normal conditions.

A little more than three months ago there was a general business depression in southern California. Peace had been declared, and at a time when apparently there was just cause for celebration and rejoicing being followed up by liberal buying of automotive products, business was at a standstill. Thousands of cars were stored in warehouses, and the thought of purchasing a new car seemed furthest from the minds of the people. People were not even looking at new cars and price reductions seemed to have practically no influence.

Dealers Got Together

It was when the skies looked blackest that a group of the most influential dealers got together and decided that nothing could be gained by waiting for the people to awaken of their own accord and buy cars, but much could be accomplished by awakening them. That it would be worth the effort at any rate was agreed upon. Accordingly, a general events' committee was appointed to decide upon a program and see to its being carried out. A show committee, a race committee and a special contest committee were named, and it further was agreed that additional committees would be selected from time to time as the need developed.

The show was held in January and was the most successful event of its kind southern California ever has had. The effect of the show was noticed at once. Sales began to increase. Sub-dealers who had been disheartened and upon the verge of quitting their lines became enthusiastic and agreed to hold on. January saw a big gain in the number of cars sold over any of the preceding six months. February business was even better. For some distributers it was the largest ever.

Now March has passed the Ides, and there are half a dozen distributers entirely without cars. Frantic appeals are being telegraphed to the factories and managers are rushing eastward. Stocks in warehouses have been cleaned up. One dealer says he has 104 orders on his books and not a car on hand. Another dealer has been out of cars for two weeks and has been bringing them down from San Francisco to help fill orders. Cars are being placed in the hands of owners at the rate of 5000 a month.

The Santa Monica race was the second on the list of events in the stimulation campaign. It was said racing was dead and an event without the best known drivers in the country participating was bound to be a failure; the people would not go to see it. Several of the so-called racing kings now in the east were asked to participate in the beach revival. They asked for $2,000 appearance money and other similar sums. They said $9,000 as prize money did not appeal to them. The race committee replied, expressing regret, but refusing to raise the ante.

There was a tremendous gathering and although race meets are very expensive, if properly conducted indications are that when the official report is made it will show a profit to the association. But even if the association does not make a nickel, the members say, something has been accomplished by stirring up interest. Owners are going out more, using their cars in every way and, like the influenza, this spirit has become contagious so that the wife of the man who does not own a car is insisting upon the purchase. And the dealers? Well, they're always ready to take orders, even if they must explain there will be a delay in delivery.

AFTER NEW WORLD RECORDS

Los Angeles, Cal., March 21—Ralph de Palma has announced that while here he will undertake to break his Florida speed marks if a proper course can be found for him. He requires a stretch of perfectly level road, or not more than 1 per cent grade, absolutely straight and at least 5 miles long. There are said to be several such stretches in the vicinity of Los Angeles. De Palma says he believes the boulevard surface in this locality better for speed work than Florida sand and that climatic conditions are such an engine will work better here than there. He will remain here two weeks waiting for a chance to go after new records.

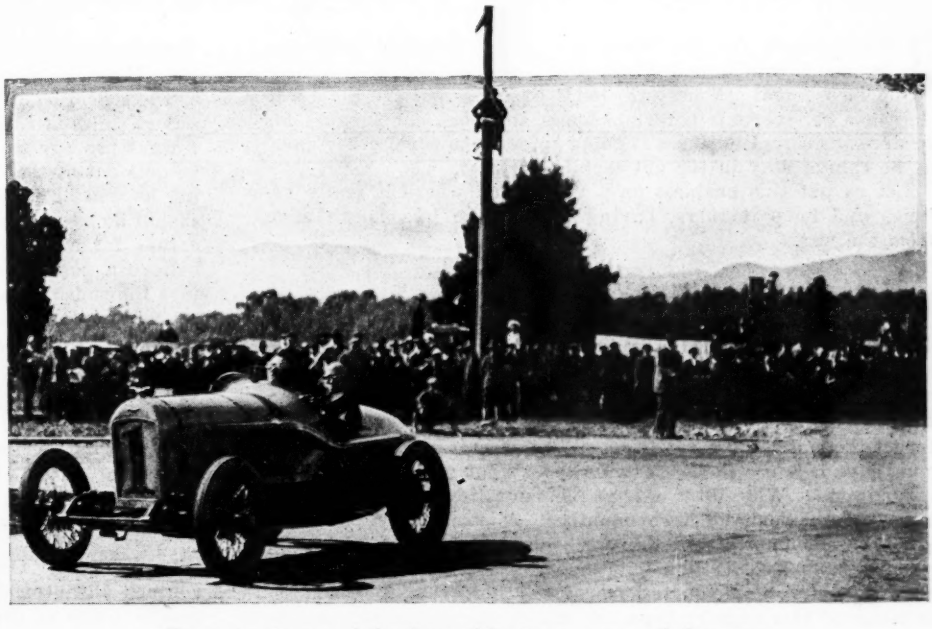
AFTERMATH OF SANTA MONICA

Los Angeles, Cal., March 21—An attempt is being made to bring suit for damages as a result of the death of a racer at Santa Monica, but so far there is nobody to name as a defendant. The race was conducted by the Los Angeles Motor Car Dealers' Association and just before the start every driver was put under arrest on the nominal charge of breaking the speed laws.

This action was taken as a protection to the authorities against just such a contingency, as in case of accident it could be shown the driver was violating the law at the time. Walter Melcher, the racer who was killed, it is claimed, was a mechanic and not qualified as a driver. He was substituted for Christensen, owner and announced driver of the car, when the latter was disqualified for unfamiliarity with the course. It is said Melcher claimed to be familiar with the course before being permitted to drive.

N. I. & V. A. CONVENTION

Chicago, March 21—The twenty-sixth annual convention of the National Implement & Vehicle Association again will be held here, in October, according to the decision of the executive committee of the association. This is considered the most advantageous place for the meeting as the general offices of the association are here.



Durant, winner of the Santa Monica, on one of the turns

East and West meet at Freeport. Benson, San Jose, Cal., left, greets Higgins, New York, across the expansive front of National Association Peake

Getting Service "Out of the Red"

Peake Tells How Dealers Can Put Repair Department on Right Side of Ledger

FREEPORT, Ill., March 21—That the service department of a motor car dealer's establishment can be transformed from the wrong side of the ledger to the right one and can be turned from a loss to a paying portion of a business was the suggestion of E. E. Peake to Stephens' distributers here Wednesday in his talk before the distribution organization of the Stephens Motor Branch of the Moline Plow Co.

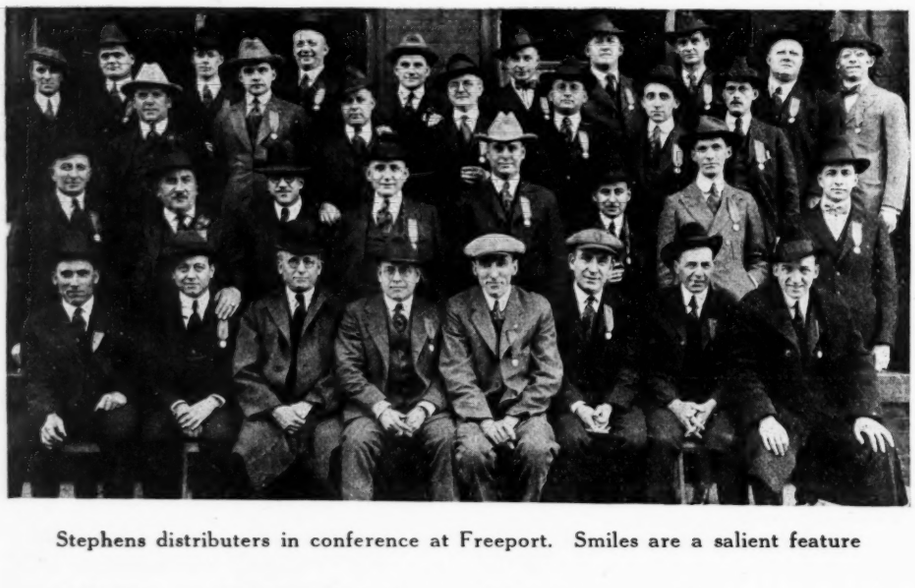
Ed. Peake, former executive secretary of the National Automobile Dealers' Association, also sold his hearers on the idea that motor cars should be marketed as a public utility as the third transportation system and the most important one of a community.

This talk was one of the features of the annual conference of Stephens' distributers March 17-19, at which thirty distributers, representing twenty different organizations which have the wholesaling of Stephens' cars throughout the country, met to complete plans for the coming year. Incidentally this conference, like similar ones in other organizations, was made the opportunity for the distributers to impress their desires upon the sales, engineering and service departments of the factory. This was done through round-table discussion, at which the distributers came to an agreement upon what they wanted and at the same time presented the idea to the factory men.

Dealers Present Needs

This method proved most effective and resulted in the dealers getting the needs of their territories in the way of such features as body colors, styles of tires and similar questions which often are sources of argument when not threshed out at the beginning of the season. It is not too much to say that rarely, if ever, has there been more unanimity of opinion between the distributers themselves and between distributers and factory than was exhibited at this meeting.

Stephens is planning for a large production and has capacity for from 12,000 to 15,000 cars this year.



Stephens distributers in conference at Freeport. Smiles are a salient feature

What Ed Peake Had to Say to Stephens Distributers

THE business you gentlemen are in is a serious business—it has grown from the gay and frivolous business it used to be into a real "honest to God" business and the man who does not believe it is a real business and does not conduct his business as a real business is going to get into some other game as he cannot stay in the automobile business.

Let us put this business on a foundation where it really belongs and keep it there, having learned the lessons we have from the war.

Community Idea of Car

The thing we must put into this business, the thing we must drive home to the community in which we live, and that is the community idea for the automobile. What does it mean to your community and to my community, this thing you are selling—forget it is an automobile, that it has wire wheels, cord tires, forget the make, color and paint. What does it mean to the community and its use to the community? What goes to make up a community? Why do we have communities—what must we have before we have a community? A community before it can be a community must have schools, it must have churches, it must have electric lights, it must have street cars, it must have gas, etc. Can you tell me of anything that means more to cities of this country than the use of the automobile means to that community? There is not one of the other things outlined here that is not largely dependent to its success on the use of the automobile.

The school board of a certain city frowned at the idea of high school children riding to school in automobiles. I'm telling you I want my boy to go to school in an automobile because when he gets out of that automobile and goes into school in the morning he will be fresh and will have a higher idea as to what he should do as a man than he would were he to wait on the street corner for a street car and ride to school in a stuffy car. I believe a person who rides to church Sunday morning and enjoys the sunshine and fresh outdoor air, when he gets to church his mind is in a more receptive mood than the person who has to take a street car and gets there.

What does the automobile mean to the real estate of a town? You can take any large city of this country and take me to what is considered the finest residence district and I can prove to you it is the best residence district because it is out from the center of the city on account of the use of the automobile.

Motor Car as Public Utility

Public Utility Use of the Motor Car.—For heavens sake, when you sell an automobile from now on do not think of the automobile, think of the use that car is going to be to the man you are selling it to, and when you begin selling the automobile

from that point of view you are selling it from the right point of view.

Comparing motor cars of a community, as to use, with the principal utility—and the principal utility of any city is the street car—I investigated this in Kansas City and talked to the chamber of commerce regarding it. Kansas City has 20,000 automobiles with carrying capacity of five people to the car, or a carrying capacity of 100,000 people in automobiles. I found we had a maximum of 600 street cars with capacity of fifty people to a car, or a carrying capacity of 30,000 people—in other words, the automobiles of Kansas City will accommodate 100,000 of the population while the street cars could only carry 30,000 should the entire population desire to go to the city at one time. Note the consideration the street railway company gets in different communities. We give them the center of the streets for a period of fifty years and say, it is yours, and we have cities that try to put the automobile down and out and the carrying capacity of the automobile is ten times that of the street car in Kansas City.

A Third Transportation System

There is a new era coming in this country and there can be no new era without transportation. We have two modes of transportation—water and rail and the third is the automobile. This new line is growing so rapidly that people cannot appreciate it and the only thing that will threaten this third system is the air system which is some way off in my opinion. If we in this business with over five million automobiles in use, increase yearly 40 per cent in normal times what are we coming to?

We are coming to doing business by automobile. You hear a cry from the street-car companies wanting higher fare because they are not able to carry on their investment without further fare. People are not going to ride on slow moving street cars. The street car companies do not seem to get the idea that they have a competitor in the automobile that they cannot stop. Let us analyze the use of the automobile in our own community and sell it in our community as an asset. We are answering the call of the third transportation system.

Take the payrolls in different communities account of the automobile business. Over $11,000,000 is paid out in Syracuse because of the automobile business in one year—34 per cent of the people in Syracuse get their living account of automobiles or accessories and so I say let us sell this community idea because just so long as we do not sell that to the public we are going to be threatened by legislators because the only thing they have to do is lay a law that is going to make it hard to sell an automobile if this business is so it can be throttled by foolish legislation.

Fast growth and development of cities and production is going to be due to the use of the automobile. The city that will advance fastest commercially will be the city that makes it easiest to develop, sell and use the automobile in that city.

Diagnose Your Business

How is your business? The minister says, "how is your soul?" The doctor says, "how is your constitution" and I say to you, "how is your business—is it sick or is it healthy." You must be the physician or doctor of that business. Can you diagnose your business, have all its symptoms at your finger tips? I am going to try to tell you how, in case you do not know. You know it does not take much of a doctor to cure a disease if he knows the symptoms. There are two elements that make up your general constitution as an automobile dealer. First, your standing in the community. How do you stand and how does your organization stand socially, in a business way, morally in your community? That is something you cannot get away from.

Second, how are your factory connections, first as to the car itself and as to the proper contract with factory? There is no use for you to sell an automobile that you are not enthusiastic about. If you do not think the car you are selling is worth the price in the catalog you are constitutionally wrong. If your dealings with your factory are on a basis where every time you open the door in the morning and close it at night you think your commission is not sufficient, your factory relationship is not right—there is a constitutional trouble that must be removed before you are right.

Location of Your Business—Is your business properly located? Are you hidden or are you in plain view. The automobile business is not one of hide-and-seek. People may find you but will not look for you. Your equipment is essential. When it comes to the operation of your business there are four senses on which you will rise or fall. They are advertising, sales, service and trading in of old cars. These are the four points you should look over every day.

Advertising—We all advertise and there are forty different ways of advertising. It is not for me to tell you the best way. Let's get rid of fake advertising. Money has been wasted in advertising because of poor selection of mediums, in selection of too many mediums. I put the daily newspapers first, then possibly billboards second and way down about forty columns below theater program advertising.

Do not forget unless your ad is properly written, gotten up in good style, you might as well save the money. I read so many ads, possibly two, three or one—I pick out the most attractive. I know automobile dealers who write advertisements themselves and spend $200 and they like them because they wrote them themselves. But listen—you are not buying this automobile. Because you have put something cute in this ad do not think it is O.K. It may be rotten. Every ad is in competition with every other ad in the magazines or newspapers and if you are going to spend money do not spend it in a haphazard way. Spend your money but know you are spending it rightly.

Sales—There is no other industry in the world that handles as much money in a year in selling organizations of this country and keeps as little money in the way of profits as the automobile dealers. We waste it in advertising, in sales, how? By not carrying on our sales organization in a systematic way. If you are a real organizer and a real salesman yourself then it is all right for you to run the sales organization but because you happen to be owner of a business does not necessitate that you are a cracker-jack salesman and can make cracker-jack salesmen. If you diagnose and find you are not capable admit it and get someone who is.

We are making a mistake in not keeping proper card indexes on prospects. If a salesman hands in a card to me reading, "John Jones, Flatiron Bldg., New York, prospect for car" I do not consider that enough. I would want to know if he has any children, whether he is a golf fiend, a fishing bug, and if he happened to be a nut on fishing and this man who was trying to sell him a car was not a fisherman I would send the man who was a fisherman up to sell the fisherman. I would not send a Sunday School teacher up to sell a saloon keeper an automobile.

"Sold Service Satisfies"

Service—We lose money on the service end of our business. I want you to remember this—there is only one kind of service that sells, there is only one kind of service that pays, there is only one kind of service that satisfies and I want you to carry this right home with you and if you think enough of it have it printed and framed and put it by your service man's desk—

"Sold service satisfies."

There is no other kind of service that satisfies. If you give it away it does not satisfy you, it does not satisfy the man you give it to for he keeps coming to the free altar of service. If this business is going to be maintained on the high standard it must be we must stop giving away things, we must get money for the things we give. Service costs someone money—it costs you money if you give it away—it costs the customer money if you sell it—where are you going to put the money, in the customer's pocket or your own?

Old Car Question—Did you ever stop to think that men who come around and buy automobiles from $1,000 to $5,000 are not crazy. They very often sell you their old car. They very often sell our salesman and then the salesman comes and sits across the desk from us and sells us the car. He tells us we are getting it for $800 and can easily get $1,000. We let the salesman sell us the old car and the prospective customer sell us the old car and we are the goat.

Preach Good Roads

Good Roads—In the next ten years we will see ribbons of good roads running across the country. We must put this good roads idea over in every community in which we live. Just as in the great war in Europe, we are seeing a new light and as that light shines out to you it is the great light of opportunity for 1919.

"Plug the Leaks in Gasoline Sales," Says Bill Strong

BILL STRONG cleared away the last of the morning's correspondence and his stenographer, trim and efficient, already had begun to click out his dictation. Each finished epistle bore a mark of snug perfection, of inherent neatness and that intangible thing called style, which instantly and unmistakably proclaimed, to the eyes of even the most unobserving recipient of one of these typographical gems, the air of distinction which permeated every detail of Bill's glistening business machine.

Bill picked up his memorandum book, the only object save an unobtrusive inkstand allowed to grace the smooth mirror surface of his glass-topped desk. He quickly turned to the page of the day's duties and ran his keen eye over the list. There was an appointment at 10:30 with the shop superintendent to consider the purchase of new steel bins for the stockroom. There was a conference at 11 with the man who had charge of the accessory store, to work out new and effective window displays for each of the four weeks in the coming month. And a half-dozen other matters of lesser importance, all recorded in an exceedingly readable hand by his stenographer, the order in which they had been received.

The telephone bell rang and was answered by the girl almost before the sound had died away. In keeping with his pronounced ideas on matters of office efficiency and a sensible love and keen appreciation of perfection of detail, it was not the fierce, strident ring of the usual telephone whose harsh, sudden peal abruptly and rudely interrupts the mental processes of all those within range but a soft, harmonious, muffled tone just powerful enough to be heard easily in the room. When Bill had some thinking to do he wished to have as little distraction as possible—to give all that was in him to the problem in hand. It wasn't fussiness but simply was No. 1 efficiency.

"It's Walter Anderson, of the Acme garage," she announced.

"I'll talk to him," he answered, reaching for his telephone, on the same extension.

"Hello, Walter, what's on your mind?"

"Can't find the leaks in gasoline sales?"

"Glad to help you."

"Any time after 11:30."

"All right. After lunch, 1:30.

"Goodby."

The girl already was noting the appointment down in the memorandum book.

Fair Exchange of Ideas

Anderson owned a garage on the other side of Liveburg, and he was one of several men in the garage business with whom Bill was on terms of closest intimacy. Anderson was more of a mechanic than a business man. Not that his business did not win him a good living, but his bent was for mechanics rather than business. Bill, in accordance with his far-sighted, broad-minded ideas of business, always was pleased to furnish information, and he usually got back as much as he gave, even though he was the leading figure in the garage business in that territory. Only the week before he had been over to visit Anderson's Acme garage and saw there a simple tool for chucking pistons for lathe work that would save a lot of time when oil grooves were to be cut or the sides of the piston ring grooves smoothed up.

Precisely at 1:30 Anderson opened the door to Bill's office and found him waiting.

After the usual greetings, Anderson began:

"There is something wrong with my system for recording gasoline sales and yet I can't for the life of me put my finger on the trouble. I buy more than I sell. My tanks don't leak. I get full measure. My pumps are accurate. It is not being stolen nor is it being wasted, and yet every month my sales do not tally with the fuel I buy, closer than 100 gal. Sometimes it is nearer 200, which is $25 to $50.

"I'll admit I am to blame for not getting after this matter sooner. I've been selling gasoline for years yet it is only the last few months that I have really had what ought to be a decent system. The exasperating part about it is that now that I have a system and am keeping careful count of the fuel I buy and sell, I find that I am apparently losing a nice, respectable sum of money every month."

"You are sure the discrepancy is not caused by any of the ways you have mentioned?"

"Positive. I've been over every detail several times and am quite confident the difficult does not lie at any of the points I have enumerated."

"What's your system?" queried Bill, feeling sure he had picked up the scent.

"Why, I use sales slips which are turned over to a bookkeeper at the end of each day. It's the standard system. The book-

keeper is all right, and so is the bookkeeping system.''

This confirmed Bill's suspicion and he asked: ''You sell a lot of gasoline, don't you? Especially Saturdays and Sundays this end of your business is fairly swamped?''

''Yes,'' affirmed Anderson, wonderingly.

''I had the same trouble that you describe several years ago, and I believe the remedy I found will cure your case,'' Bill began.

''The trouble I found was that in the bustle that centers around the pump on rush days there is naturally some forgetfulness. You sell the gasoline all right, but it is not recorded on sales slips. While one owner is driving away, someone else demands the attention of the man at the pump before he can make out the sales slip. He may even start to make it out, when he is summoned by the insistent call of some impatient owner.

Let Owner Sign

''It is a good practice to make it a rule that every charge slip, for gasoline or any other item, be signed by the owner. This custom practically holds the owner there until the slip is made out. But I found that although this reduced the loss it did not eliminate it for even at that there was some forgetfulness, and some carelessness, and once in a while we would get a man who was dishonest besides.

''You practically can eliminate this loss at the wave of the hand by switching over to a strictly cash basis, but I know you are not quite ready to do that, so I'll describe the simple system I evolved before I started to run a strictly cash business.

''Bring your chair up,'' suggested Bill, as he reached into the left top drawer of his desk and pulled out a pad. The place for that pad was part of Bill's success.

''I decided if I kept a running record of my gasoline sales, with the pump readings carefully noted, that if some man who operated the pump forgot to make out the sales slip, I would possess sufficient clue to find the error, especially if I glanced at the pad often enough to show the error while it was still fresh.

''The trouble with gasoline is it is all gasoline and you can't see it. If a dozen men come into my accessory store in the course of an hour, no two of them likely will buy the same articles, so if an error did occur it would be easier to trace, but gasoline is just gasoline, no matter to whom sold.

''So I took a pad about this size, 5 by 8 in., and had my stenographer rule it as shown, putting in the column headings. The pad was hung to the pump. A new sheet was made out every day, and if necessary more than one sheet was used. The date appeared at the top of each sheet.

''Let's make believe we have just started a day. The first man who comes along to buy gasoline is John Kemble. Our sheet is all made out and the pump meter reading brought forward from the day before, 17,853. Also we verify it to see if any was used or sold since. We sell John Kemble 20 gal., and the meter reads 17,873. We jot down John Kemble's name, the meter reading, the number of gallons sold and whether it is cash or credit. This is just the work of a moment. There are no slips to tear out, no carbons to fix and so takes only 5 sec. Time me.

''The next two purchases are recorded similarly. Then a stranger drives up in a big Pierce and buys 13 gal. We do not know his name so we put down the name of the car. That is sufficient identification for our purpose as you will see presently.

''Then Morley Patterson buys 18 gal. So far the man at the pump has made no bulls. Later another man drives up, and in the rush and bustle this transaction is forgotten. Let's leave a blank space here and pass to Charley Coolidge, who takes 22 gal. Here is where we catch that error. The men that sell gasoline are required to check up the present meter reading with the previous recorded sale, so when the pump attendant goes to jot down Charley's purchase he mentally adds 22 to the previous reading of 17,924 and gets 17,946, but the meter actually reads 17,952. Somebody has got 6 gal. which have not been recorded.

''It becomes the duty of this man to find out who sold the gasoline and who received it. But before doing this he writes down the quantity, 6. As the 6 gal. were purchased only a few minutes before, the incident is fresh in the mind of the man who made the sale even if not in one or more others who observed. If through confusion or poor memory he should say Morley Patterson or some other recent purchaser, reference to the list quickly would show this was wrong and thus would force the naming of the right person. So it develops that Albert Childs was the man who got away with the 6 gal. of gasoline.

''The advantage of the pad was I could run my eye over it every once in a while and note if anything was wrong. It only took a minute. This action made every man very careful, not only not to forget to record his sales but also to see the previous sale was recorded. I made them understand that the man who let an error slip by was more culpable as far as this system was concerned than the man who actually forgot to record the sale.

''This system is the only one I ever found which would keep a check on several men tending the same pump. If it were possible to detail one man to this work, it would be easy to hold him responsible, but this is usually unfeasible or impossible.

''This system may be used with or without sales slips, but of course sales slips are advisable. The slips and the record sheet go to the bookkeeper together every morning so he may check one against the other. You'll be surprised how often the information on the record sheet aids in correcting a slip improperly or incompletely made out.''

Date_____

OWNER	CAR	METER READING	QUANTITY	CASH or CREDIT
Brought forward		17853		
John Kemble		17873	20	Credit
George Fuller		17888	15	Cash
Donald White		17893	5	Cash
	Pierce	17906	13	Cash
Morley Patterson		17924	18	Credit
Albert Childs		17930	6	Credit
Charley Coolidge		17952	22 (17946)	Credit
Henry Randolph		17972	20	Credit

Specimen charge slip for gasoline sales

AN OBJECT LESSON

Des Moines, Iowa, March 21—Mud. Mud. Mud—seas of mud, oceans of mud. Talk about the mud on the battlefields of Europe. It could hardly have been any worse than the mud in Iowa is at the present time and as it has been nearly all through the winter.

If ever a state had an object lesson in the necessity for good roads, certainly Iowa has had it this last winter, and now that spring is about here it is being accentuated, literally being rubbed in. The whole state is and has been in the mud and business in all lines is suffering seriously.

One notices this particularly in the small towns. Usually these towns present a reasonably busy appearance. There are always evidences of the farmers who live in the vicinity. It is different now. There isn't a vestige of evidence—not a horse and wagon, not a buggy, not a car—the streets are utterly deserted hour after hour. The country is literally isolated. Farmers cannot get to town and people in town cannot get to the country. The automotive business in particular is at a complete standstill and will be until the roads get passable.

The winter has been mild and open, with very little snow until recently. The roads have been soft all winter, and as the late snows went off they became little better than bottomless quagmires. And now that the spring rains have begun, they will be even worse.

The terrible condition of the roads has convinced the last doubting farmer that Iowa must have good roads, and one hears everywhere that all local opposition to road improvement has given way to a determination to make a state-wide and concerted effort to do something. Under the circumstances there is not the shadow of a doubt about the adoption of the good roads bill now ready to report to the legislature, and the work of road imprvement, so long ignored and delayed in this greatest of all the agricultural states, will begin in earnest. It is high time.

FORTY ACRES FOR PARKING

Des Moines, Iowa, March 21—The Iowa state fairgrounds is to have the largest motor car park in the Middle West. The Iowa legislature this week passed a bill appropriating $63,000 for the purchase of 40 acres adjoining the fairgrounds to be used for parking cars. Of this amount $9,000 is to be used for paving.

Garage Planning
Service Station Arrangements

No. 26

Q.—I am inclosing dimensions and location of a brick or tile building which I desire to erect for use as a garage and handling accessories and cars in connection. You will note from this drawing that the frontage is 105 ft. This is to be glass, with the exception of the entrance. The garage is to extend from the main street to the alley, a depth of 145 ft. There are no buildings on either side at the rear, and this being the case, there would be plenty of light for a workroom in the rear. We would want in front an office, place to handle accessories, as well as a showroom or salesroom for cars, as I expect to handle at least two different makes of cars, which would require room for displaying at least four cars. I should like to have some suggestions for arranging the interior of the building.—Caney Valley Motor Co., Wharton, Tex.

Here is a rather complete layout for a garage of the size mentioned in your letter. This garage will accommodate a maximum of about forty-five cars, with all of them accessible to the aisles. As may be seen, there is one car entrance in the front and two in the rear, so that cars may drive through without being obliged to turn around. No provision is made for inside turning, but space might be maintained at A-B for a passageway until all other spaces were filled.

Continuous windows are provided at the rear of the existing structures, which should provide all the light necessary for the garage and repairshops. The front part of the garage would be improved, however, by the complete installation of one or two skylights above that part.

MOTOR AGE **is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be sure to include the following information:**

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repairshop.

And how much of an accessory department is anticipated.

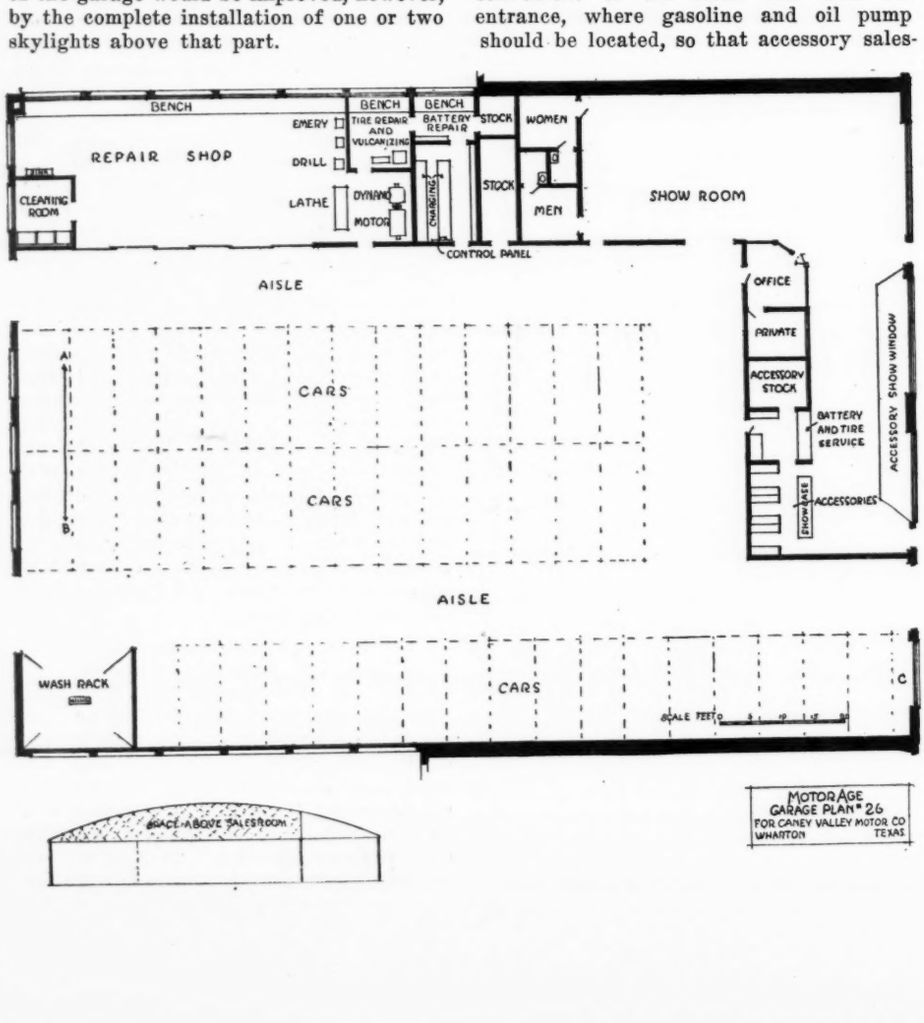
The sales showroom is large enough to display four cars, while by cutting down the accessory show window to one side of the center pier a tractor could be included.

Accessory showcases and shelves are convenient to the front door and car entrance, where gasoline and oil pump should be located, so that accessory salesmen can look after the gasoline sales. The battery and time service counter is next to the accessories, making it possible for one person to attend to all these duties when business is light.

The shop is wide enough to allow cars to be run in and still have room to work around them. There is also room for some special machinery besides the regular lathe, drill press, etc. Separate rooms for tire repairing and vulcanizing, as well as battery repairing and charging, which should be well ventilated, keep the disagreeable smells from being diffused to the rest of the garage and showrooms.

Waiting rooms for men and women are provided, which, though not spacious, have room for a magazine table and some comfortable chairs.

The roof of the garage should be carried on trusses, but that of the shop, showroom and front portion might be on plain rafters. The space above the front salesroom, where the rafters rise to meet the high point of the trusses, well could be used as storage space—see small section.



No. 27

Q—Show a good plan for a garage building, 82 by 90 ft., one story high. This is to have display room, office, accessory and parts room, wash basin, workroom and benches, wash rack and every equipment to make a first-class garage. How many cars will this size building store after such equipment is made?—Virgil E. Gale, Poseyville, Ind.

No. 28

Q—I have a lot 110 by 80 ft., on which I want to build a garage which will take care of thirty cars on the sides, driveway not to be included. I want to build this of tile, with posts for roof support. Please show building plan, and suggest kind of heating arrangement preferable, steam or hot air.—A. C. Meeker, Adena, Ohio.

Here are two inquiries which are interesting in that they are the same width and vary only in length. Consequently, the layouts are more or less interchangeable.

No. 27

You do not state what position your lot occupies in the block, so we assume it is the regulation inside lot with an alley in the rear. This allows for an aisle running straight through with entrance only in front and exit in the rear.

By segregating the short cars on one side a passage way may be maintained behind them, connecting the office, showroom, accessory store and repairshop. The office is inclosed by a railing, and there is a private office where more important deals may be transacted. Battery and tire repairs should be handled by the accessory store, and a back door is provided through the accessory stockroom for quick passage to these departments. The windows at the

rear are of the all-metal sash factory type, giving all the light available.

As planned, this garage will accommodate twenty-four cars.

No. 28

We have supplied everything asked for in this except the posts, and since posts are the most evil of all necessary evils around a garage, we feel quite elated. If the lot had been 5 ft. narrower, this would not be feasible. As it stands, the 80 ft. with 2 ft. subtracted for outside walls divides into three equal parts. A 16-ft. strip reserved on each side for storage will accommodate the required thirty cars; a 10-ft. passage on each side, one in and one out, makes every car accessible. The central strip is reserved for showroom, office, repairshop, etc.

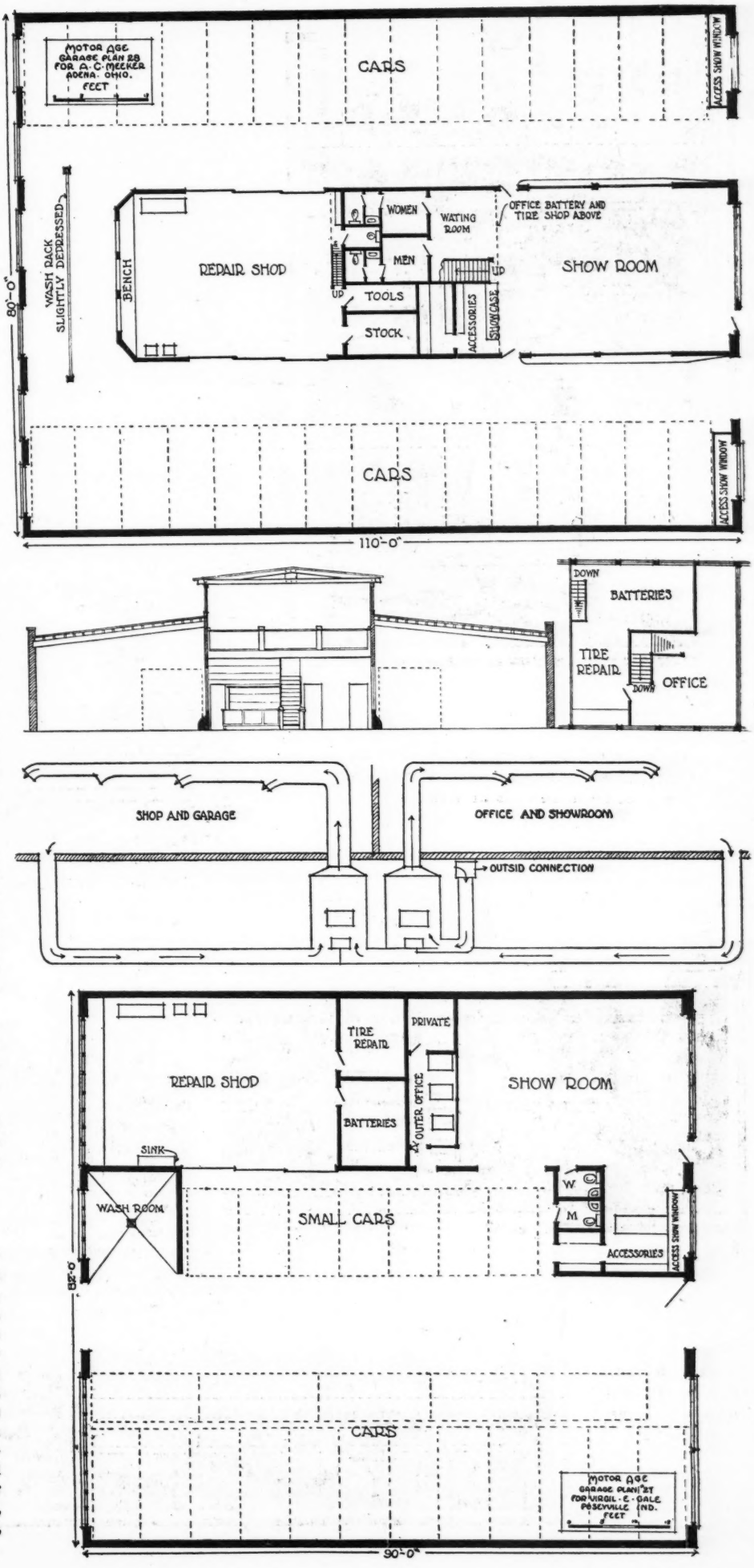
By referring to the sectional view it can be seen how well this plan works out. The central section is raised about 6 ft. above the sides, giving space for two solid rows of windows. These light the showroom, office and repairshop. Plate glass incloses the showroom on three sides, the side windows being protected from passing cars by a concrete curbing.

A wall across the back of the office on the upper floor keeps all fumes and smoke from passing from repairshop to showroom and office. As regards heating, hot air is by far the cheapest to install and also cheap to operate, provided the air is reheated, that is, circulated through the furnace by return pipes conecting with registers in the floor. This method has the disadvantage, however, of picking up all the stray smoke and odors in the building and returning them to the furnace and distributing them to all parts.

If a man were adjusting a carbureter in the repairshop, the smoke would be in the showroom, too, etc. One might install two distinct furnaces—see sketch—one small one to heat the showroom, offices, etc., using fresh outside air, and a larger one to heat the rest of the building. The larger would draw its air from the showroom and also have a return duct from the shop.

After all is said, steam heat probably is the best, though more expensive than any other but hot water. With steam the heat of each section of the building can be regulated best.

The location of the furnace room would depend on the system used. If steam, one corner at the rear would be best but if hot air, a central location is preferred.

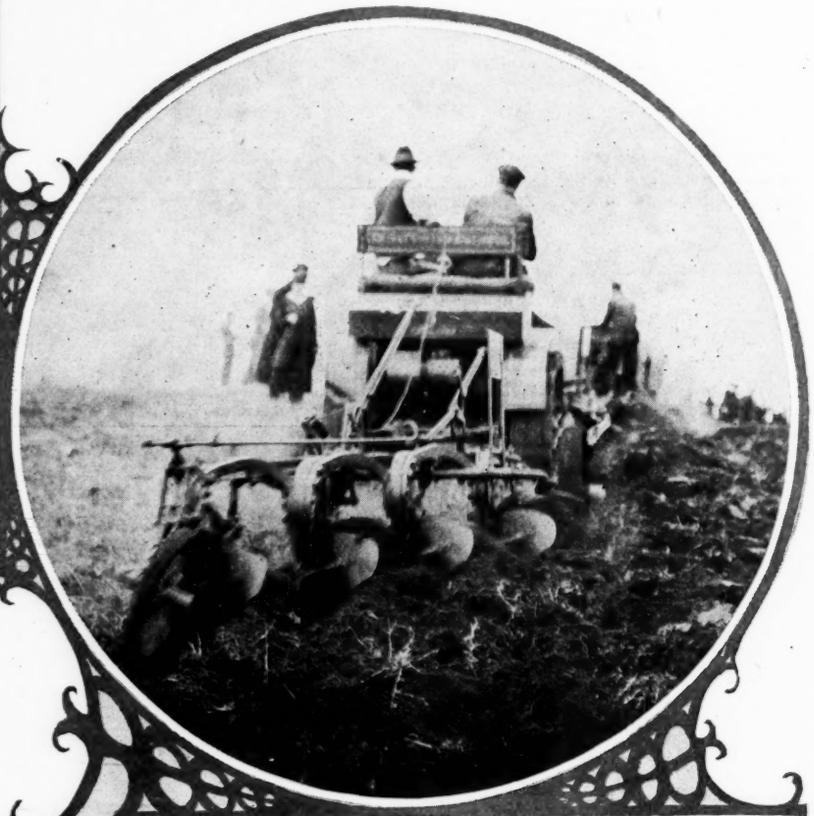


DEALER DINES PROSPECTS

Lincoln, Ill., March 21—The Langellier Motor Co. is going after spring business energetically. Acting upon the old axiom that the surest way to reach a man's pocketbook is via his stomach, a dinner was served in the garage to 200 Logan County farmers who were believed to be Fordson tractor prospects. Each guest was given a badge of white ribbon upon which was printed: "Better Farming; the Fordson Tractor Way." U. S. Dickerson of Bloomington, who is central Illinois territorial manager, delivered an address. Other speakers were J. L. Lindquist, South Bend, Ind., and J. K. Foster, of Springfield, Ohio, who told of farming methods.

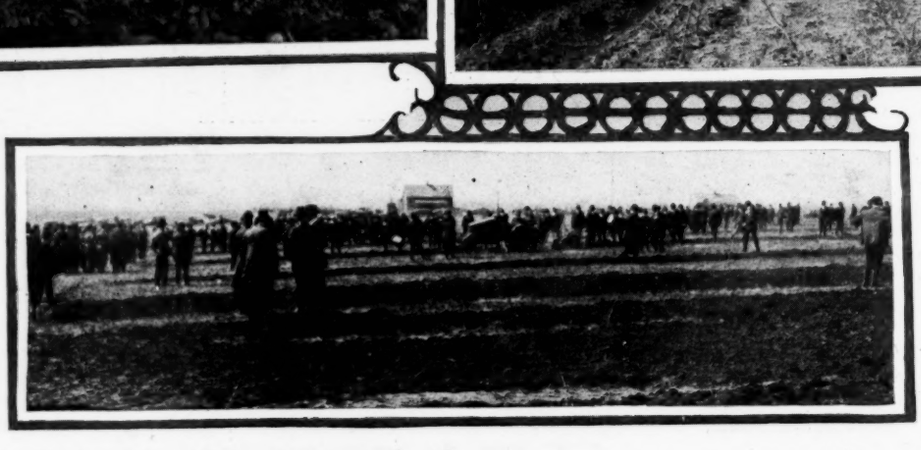
With the Tractor Crowd At Macon, Georgia

Typical street scene in Macon, showing crowds around the tractors. A close-up of the Oliver tractor, adapted to southern soil specially, is at right



While no tests were held, there was some plowing, as shown here

Showing how close tractors can come to trees in peach orchard



Southern Tractor Requirements

Protection of Working Parts from Dust and Sand of Greatest Importance

By B. M. Ikert
Motor Age Editorial Staff

MACON, Ga., March 21—To combat Southern soil conditions successfully tractors must be exceptionally well protected from dust. For reliable, efficient service and low upkeep, there must be a better inclosure of working parts than manifested on certain makes of tractors. A drive through the country surrounding Macon, Atlanta and other cities of Georgia convinces one that the sandy condition of the soil is going to play havoc with tractors if not guarded against. The general lay of the land and soil characteristics are ideally suited for working with the tractor, as was shown at the Dixie demonstration.

Nothing will make a tractor short lived so much as exposure of working parts to sand. It does not mean that only the engine parts should be inclosed, but those subjected to abnormal wear, as the steering gear, drive pinions, bull gears, wheel spindles, etc.

Air Cleaners Necessary

Air cleaners are absolutely necessary in Georgia soil, in fact, in any of the soil of the Southeast. Although the demonstration field at Macon was not entirely dry while the plowing was going on, the dust at times was terrific. If the tractor maker is going to stand behind his distributer and dealer in Dixie, and if service and maintenance cost are going to be stripped to bed rock, he will make sure his tractor is fitted with the best possible means for cleaning the incoming air on the carbureter. Questioning the dealers in this vicinity one finds the sandy condition of the soil gets in its destructive work on car and truck engines to a greater or less extent. Thus there is considerable cylinder reboring going on throughout the cotton states.

Georgia sand mixed with the oil in the crankcase of the tractor engine makes a cutting compound second only to emery and oil itself. Obviously bearing life under such influences is short.

But it is not only the engine we must go after. It is highly important that gears be inclosed, as far as possible and provision made that sand will not come in contact with the surfaces of the bull pinion and gear, if the tractor is of this type. The bull pinion and gears are subjected to very heavy loads as it is, and their tooth surfaces will be rapidly cut down when sand gets between, no matter how well they are made or how hard the surfaces.

A cover should be put over the engine valve mechanism with a good heavy gasket underneath so sand cannot get at the working parts. This also holds true of the governor parts. Rocker arms and such mechanism as may be employed for valve action travel very fast, and when sand gets into the bearing surfaces the resultant cutting action is just that much faster.

Owing to the hilly condition of the Southeast generally there is bound to be considerable pressure on the wheel bearings in addition to that set up by the pull of the plow and other factors such as weight of the machine. It means that if the tractor is of the wheeled type, the spindles must be protected by suitable dust caps over the hubs. There must be a copious use of felt washers also, not only to keep the dust out but the lubricant in. The bearing surfaces of the steering gear must not be overlooked, and makers might do well to fit leather boots over the joints of the tie rod and drag link, unless the tractor is operated by cables or chains.

Inspection of some of the present-day tractor transmission layouts shows that not sufficient thought has been put on the question of keeping sand out of the gearsets. On some designs the gearshifting shafts are exposed when the lever is in certain positions and at other times housed within the case. The result is sand collects on the ends of the shifting shafts and is carried into the case ultimately. The combination of grease and sand on the shafts makes a gritty substance that enlarges the hole in the case through which the shafts work and gives the sand all the more chance to get in. A suitable cover of some kind, a light stamping, or sheet iron cover with a gasket between it and the case will go a long ways toward eliminating transmission troubles from sand.

These are some of the major things to be considered in the design of a tractor for the Southeast, for it must be remembered tractor service is as yet almost unknown here, although there are already some tractors in use. By eliminating troubles resulting from wear the tractor maker can go a long ways toward giving the Southern farmer what he wants. Distribution and service then become a relatively much easier matter.

TRUCKS ON TRAIN TIME

Indianapolis, Ind., March 21—The International Transportation Co., incorporated under the laws of Indianapolis, has started the preliminaries to the organization of overland truck transfer which will make Indianapolis the center of several lines of trucks running in all directions, connecting with large cities and operating at railroad rates.

The plan is to connect Indianapolis with Chicago with motor trucks as carriers first and others later. With 5-ton trucks and 5-ton trailers the company expects to follow the general plan of the railroads in their details.

Through trains will be run from Chicago to Indianapolis, stopping only at Lafayette, which will be a terminal, where drivers will be exchanged and inspections made. There will be local trains, made up of 2-ton trucks and 2-ton trailers and on these locals the produce from the smaller towns will be carried to the larger centers.

The president is C. E. Traweek, of Niles City, Mont., a ranchman. The vice-president is R. W. Anderson of Lafayette, and the secretary-treasurer is C. L. Smith of Monon. The capitalization of the company is $500,000.

Modified 5-ton Holt for farm work, shown at Macon for first time plowing

Spring Overhauling—Engines

A Timely Article for Dealers and Garagemen

In Two Parts—Part II

By T. P. Bowman

WITH a quantity of good-grade valve grinding compound you can begin regrinding. First, place the coil spring over the valve stem and with the finger apply a moderate amount of the compound to the face of the valve. Place the valve in its guide, and with the grinding tool, work the valve around and back in its seat, being careful not to bear down too heavily on it. To accomplish this action, place the handle of the tool between the hands as shown in Fig. 9 and work the hands back and forth to transmit a rotary motion to the tool. The valve should not be given more than three-quarters of a turn in one direction without releasing the pressure and raising the valve from its seat.

For example: Press the valve gently down in its seat, revolve it to the right or left three-quarters of a turn, let the spring raise the valve from its seat, press down again and revolve back. At regular intervals, every third or fourth forward and backward motion, change the position of the valve in the seat so it will be reground equally and evenly all the way around. After a minute or so of grinding, remove the valve and clean it thoroughly with gasoline. Also clean the valve seat and port with gasoline and a cloth.

Coloring Valve Face

Apply a very thin coating of prussian blue or prepared lampblack to the valve face and replace the valve in its seat. Give it two or three complete revolutions and remove it. If the valve has been properly ground sufficiently, it will have left a continuous ring of coloring on the valve seat, and if turned a little more in the valve seat the face of the valve will present a polished continuous ring. If there is a spot on the valve face which shows the blue has not been touched in this operation, it is evident a perfect seat is not yet obtained and further grinding is necessary. After all the necessary attention has been given the valves they may be placed away until such time as we see fit to replace them in the engine.

Next take the cylinders. First, what constitutes a perfect cylinder? A cylinder block, before it is machined ready for use, has holes in it which represent the cylinders but are considerably smaller than the size required. For instance, if the cylinder is to be 4 in. in diameter when machined and ready for use, the original hole will be about ¼ in. smaller. This is because it is impossible to cast a perfectly smooth and true surface, and the holes, or cylinders, must be bored out by machinery to arrive at this result. A cylinder-boring machine is used for this, and generally two cuts are made in the cylinder, a cut which removes all the material except just enough which must be taken off in the finishing cut, which is a very fine cut. Sometimes a third cut is necessary to obtain the exact size, and when this is completed the cylinder walls are perfectly straight from top to bottom. The cylinder is perfectly round and the surface of the wall is nearly as smooth as polished glass. A cylinder in this condition is said to be in perfect condition.

Examine the condition of the cylinders in this job. First, see if the cylinder walls are perfectly smooth and free from scores or scratches. Second, see if the diameter of the cylinder is the same throughout, that is, beginning at the top and measuring the diameter about every inch of the depth of the cylinder. Having done this, determine whether the cylinders need repairing. If the scores or scratches are very slight, they may be remedied by lapping, but if they are too prominent they must be rebored. The lapping process may be done without any special equipment, but the reboring requires a boring machine or at least a special boring tool which can be operated by the lathe by hand.

When a cylinder requires lapping or reboring it immediately is understood the old pistons are useless so far as this particular job is concerned. Lapping or reboring increases the size of the cylinder and the pistons which undoubtedly are worn considerably will be too small. There are several methods of lapping cylinders. Since the old piston will be of no further use it probably will be the handiest to use. Remove the connecting rod and attach the piston to a shop-made lapping bar as in Fig. 10. Apply a moderate quantity of fine valve grinding compound thinned with engine oil to the outside wall of the piston and insert it in the cylinder. Work the piston up and down in the cylinder with the same motion as that described for valve grinding. Keep this operation up for a few minutes and withdraw the piston. Wash the cylinder thoroughly with gasoline and wipe it dry with a soft cloth. Examine it now to see how nearly it presents a fine, smooth surface. When sufficient lapping has been done to restore the perfect condition of the cylinder it is ready to be measured for diameter. This measurement is noted, and when making or ordering a new piston, the new piston is made about 0.004 in. smaller than the new bore. About 0.004 in. is the proper clearance between the piston and cylinder wall of 4-in. bore.

Fig. 10—Shop-made lapping bar

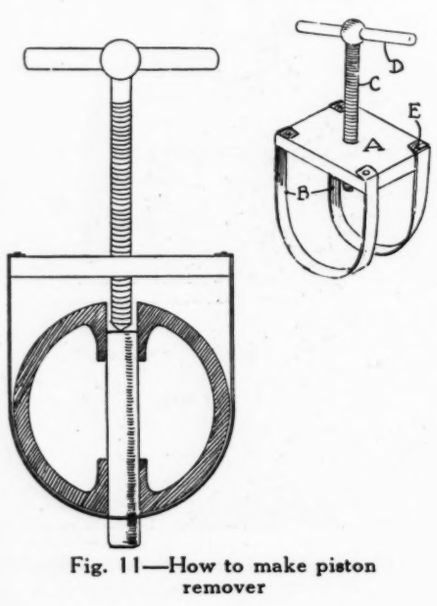


Fig. 11—How to make piston remover

Reboring Cylinders

There are cases when the scoring of a cylinder is so bad lapping would be useless, and the cylinder must be rebored. In this case the most satisfactory results are obtained by turning the reboring part of the job over to a machine shop specially equipped for this class of work.

Next in order are the pistons and rings. Very much the same can be said of the pistons as has been said of the cylinders. Their wearing surfaces should be perfectly smooth, the same as the cylinder wall, but if their surface is badly scored or scratched there is no repair for them. When a piston is perfect except for a small amount of even wear, for instance, 0.002 or 0.003 in. too small, the trouble can be remedied by heating and expanding the old piston. The heating is done in charcoal and should be done very slowly and carefully. After the piston reaches a red heat permit the charcoal fire to die out slowly so the piston is cooled in its charcoal bed. Pistons can be expanded to as much as 0.004 in. in this manner if the work is done properly.

Piston rings loose their tension after long use and cease to have enough strength to press against the cylinder wall all around. As a result oil is permitted to pass by them and enter the combustion chamber. Besides, compression sometimes is lost because the gas is permitted to escape past the rings. Excessive oil coming up into the combustion chamber is one of the first indications of poorly fitting rings. If plain rings are to be fitted, care must be taken to

fit them properly. The gap between the ends should not be more than $\frac{1}{64}$ in. or less than 0.020 in. In the case of fitting patented rings, the manufacturer has a specially machined ring for each type of engine, and it would be well to specify the make and model engine when ordering. If the engine has been rebored the amount of oversize should be stated.

When the wristpin is inserted directly into the piston it is generally a very tight fit, and considerable trouble sometimes is experienced in removing it. A piston pin remover is needed for this job, and a very efficient and simple tool can be made. See Fig. 11, which shows the construction of the tool and how it is used. A is a piece of $\frac{3}{16}$-in. flat iron 3 in. wide and 4 in. long with a hole drilled through it at F and threaded for a $\frac{7}{16}$-in. screw. C is the $\frac{7}{16}$-in. screw with a $\frac{1}{4}$-in. hole drilled through the head to admit the rod D which serves as a handle. The bands B are of $\frac{1}{16}$-in. strap iron and riveted to the block A. The piston is placed so the screw bears directly against the pin and when turned down forces the pin out the other side of the piston.

When the piston pin is secured by the connecting rod and moves in bushings in the piston bosses it is necessary to remove these bushings when they become worn. A tool such as in Fig. 12 can be made in the shop. It is just as important that the piston pin fit snugly in its bearing as it is for the connecting rod bearing to fit the crankshaft pin. When any amount of play is evident in the piston the bushings must be renewed or, in some cases where the piston pin works in the boss of the piston with no bushing arrangement, the piston bosses must be reamed to admit the insertion of an oversize piston pin.

Crankshaft

Next in line for inspection is the crankshaft, and it is very important that it be given a thorough inspection. It must be tested for even the slightest bend. Each of the pins, or journals, should be measured to determine whether they are round, as they should be, or worn out of round. This can be determined by slipping the calipers over several points of each journal or, the more accurate way, measuring them with the micrometer. To test the crankshaft for a bend place it on two centers as shown in Fig. 13 and remove it, using a gage to locate the direction of the bend, if there is any. If the shaft is bent, there will be one point of the main bearing pin which will make a contact with the gage, and as it is revolved the shaft will leave the gage. This point which makes a contact should be marked with chalk so that you will know where to apply the pressure to straighten it.

The shaft may be straightened as shown in Fig. 14. Care should be taken not to apply too much pressure in the first attempt to straighten it, as it may be bent in the opposite direction. A new test should be made after each attempt of straightening.

If the crankshaft pins require machining or turning down to make the round, it is necessary to do this job on the lathe in the ordinary repairshop. To true the main bearing pins the crankshaft is placed in the lathe and centered with reference to them. This operation is simple, only requiring that the mechanic have a knowledge of lathe work. However, with the connecting rod pins the operation is not quite so simple. No matter what sort of lathe, grinder or other machine is used, the fact that the connecting rod pins are eccentric to the main bearing pins necessitates a special dog or jig for holding it. A form of plate, or flange, with two exact centers on either side of the central one at distance exactly equal to the crank throw is absolutely essential. See Fig. 16 for proper set-up.

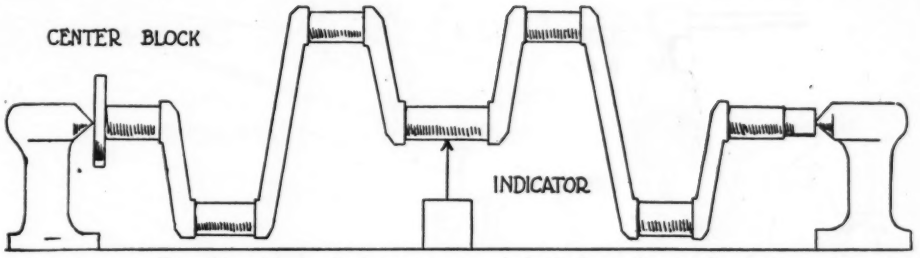


Fig. 13—Method of testing crankshaft for a bent place

There are certain cases where the condition of the crankshaft is not so bad as to require machining, in which case the pins can be lapped. There are two ways of doing this—by hand, which is more simple so far as apparatus is concerned, but is considerably slower, and by machine, which requires special fittings for the job. Fig. 15 shows a form of hand lapper. This consists of a pair of hinged members with a central hole large enough to admit various-sized bushings to conform to the various sizes of shafts. A bolt is provided to hold the two halves together, and the flanges on the bushing prevent the bushing from slipping out the side of the frame. The lapping is done by applying a fine emery grinding compound and oil to the pin and clamping the lapping tool to the work. The long handles serve as a lever for the work. The pins are polished in practically the same way by a pair of long wooden clamps constructed on somewhat the same principle as the lapping tool. The throws on the crankshaft can be lapped in the lathe by setting up the shaft between two centers for the main bearings and with the use of a special flange for the connecting rod pins. This method is illustrated in Fig. 16. It consists of a special fixture made from a large casting with a base to fasten to the face plate and a long extension arm having a split end for attaching and detaching to encircle the throw to be lapped.

Bearings

Next to be considered are the bearings. Bearings of the split type present a great deal of trouble to the repairman, and considerable practice is required before a first-class job bearing fitting can be done. Wear of the bearing is due, principally, to one of two cases, either to a soft metal which has caused vertical wear on the inside or outside of the lower half of the bushing or to a vibrating shaft which has worn an oval hole somewhere in the length of the shaft, as in the inner or outer end. In the first case the height of the worn half must be reduced. This is done either by removing sufficient metal from the bearing cap to bring the upper and lower part of the bearing metal closer together or by removing shims which may have been placed between the two halves to keep them apart. If this wear is considerable, the bearing metal should be brought so close together the hole in the bearing is slightly smaller than the diameter of the crankshaft pin. This will necessitate scraping the babbitt enough to make a working fit when the two bearing halves are clamped together.

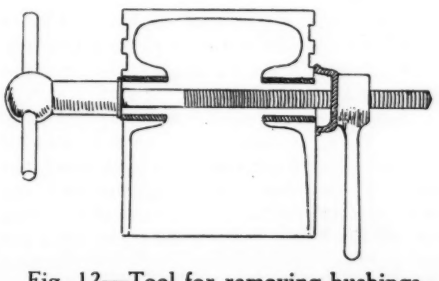


Fig. 12—Tool for removing bushings in piston bosses

Proper Clearance

Normally, there is a space of about 0.002 in. between the crankshaft bearing and the pin, this space being divided on both sides of the pin, making a clearance of 0.001 in. all around the circumference of the pin, which space is occupied by a film of lubricant. While this condition exists, and if the metal remains hard without giving under constant pounding and vibration, this film remains unbroken and the bearing remains in perfect condition. But the softer metal will give way to this pounding and vibration and there is a condition shown at A in Fig. 16. Instead of a cylindrical pin being centered in a cylindrical hole, one of the two is worn oval and because of the bearing being the softer of the two metals it is most apt to be the bearing, because the weight of the shaft along with the pressure on it keeps the shaft at the bottom of the bearing. The tendency, then, is to increase this condition, because the pin is running against the metal at only a very limited surface and all the wear is concentrated at that point. If the bearing is hard or if a hard spot should develop in the bearing, the pin will wear flat on the pressure side as in B, Fig. 16.

After the crankshaft is straightened, the main crankshaft bearings are next. Clean the bearings thoroughly and wipe them dry with a soft cloth. Do the same with the crankshaft and apply a thin coat of prussian blue to the pins. The shaft then is placed in its proper position and revolved several times in the bearings with the hands. Remove the shaft and note in what manner the blue has spotted the main bearings. If the end bearings are colored and the center one is not, it is an indication that the center bearing has received more wear than the end ones and that the end bearings

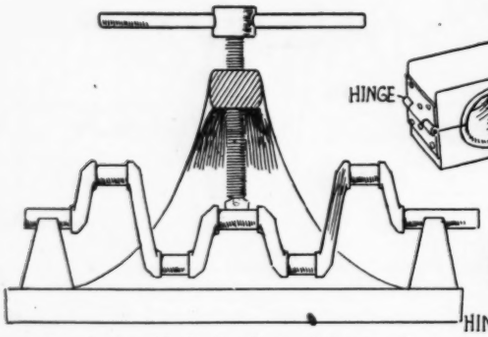


Fig. 14 — Method of straightening crankshaft

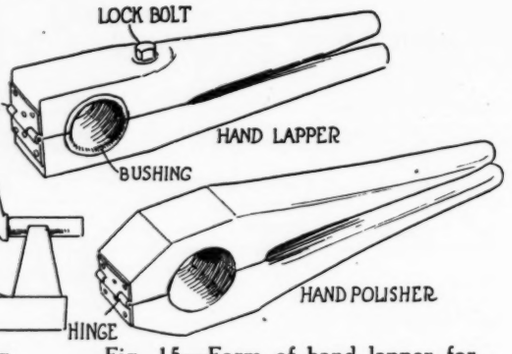


Fig. 15—Form of hand lapper for lapping pins

must be reduced in height to bring them down to a perfect line with the center one. If the center bearing and only one of the end bearings are colored, it indicates one of the end bearings has worn more than the other two or the center bearing has not received as much wear as both end bearings.

Whichever may be the case the remedy lies in scraping the babbitt metal at the required points until the three bearings are in perfect alignment. Then comes the task of scraping each of the bearings to a perfect fit, which is done by applying prussian blue to the shaft pins, clamping the shaft in its bearing by bolting the main bearing cap over the pin and revolving it several times. When the shaft is again removed, the bearings will show their high spots, which are detected by the presence of the prussian blue. These high spots are scraped off with a bearing scraper and cleaned, while a little more blue is applied to the shaft and the former operation repeated.

Fitting Bearings

This process is followed until each bearing is fitted perfectly, when nearly all the bearing is spotted by the blue as the shaft is revolved. When all main bearings are properly fitted and the caps bolted in place the crankshaft should be just loose enough in the bearing to permit revolving it by hand without the assistance of a bar or pry.

The connecting rods now may be fitted, which is done in practically the same manner as fitting the main bearings. When a connecting rod has been fitted to a crankpin and is ready for use it should be tested for tightness. A simple and an easy test is this: If the rod is raised to a vertical position on the shaft, it will stay there, but if allowed to pass beyond 20 deg. to either side of this position, it will drop down of its own weight, but will not swing to and fro on the pin. If it will do this, it is adjusted properly, but if it swings on the pin, it is too loose and must be tightened.

When the connecting rods are scraped to a fit there is one more very important test which must be made before replacing them in the pistons, and that is to test them for bends or twists. A connecting rod can be bent in either of two ways. If bent in the plane of rotation, the rod will be shortened, the piston will not go as high as it should and will go down lower than normal. Furthermore, the bend will press the piston at a slight angle in the cylinder wall and cause uneven wear of the cylinder. When bent fore and aft, Fig. 17, the upper end

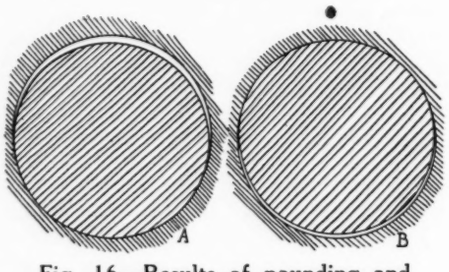


Fig. 16—Results of pounding and hard spots

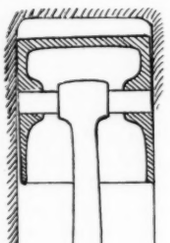


Fig. 17—Rod bent fore and aft

Fig. 18—Shop-made tool for testing rod

of the rod will run against one side of the piston or maybe only knock against it on each stroke. Special fixtures are to be had for testing connecting rods as to accuracy, but when one of these special fixtures are not available a shop-made tool such as in Fig. 18 may be used.

Attach the lower end of the rod to a mandrel bolted to the drill press table. Before doing this the small end also is fitted with a mandrel, the lower part of which is of considerable length with two vertical pegs. When the big end is bolted down, if both small pegs on the other end touch the table, it is evident the big end and the small end are parallel. If either of the pegs are off the table, it is evident the ends are not parallel and the rod is bent. To test the rod for longitudinal bend or twist, place the arms of the small end mandrel at right angles to the length of the rod. If either of the pegs are off the table, it indicates the rod is twisted.

Now that the rods are fitted and straightened they may be replaced in their respective pistons and the assembly installed in the proper cylinders. It is well to dip the pistons in oil before replacing them in the cylinders, as this will insure lubrication until the oil from the crankcase finds its way to the pistons after the engine is assembled and ready to run. Be sure the rods are placed on their proper pins and that the adjustment is the same as when fitting.

Having determined whether the camshaft bearings and timing gears require renewal, and having done this if necessary, the engine is ready for assembly.

TO PREVENT CAR THEFTS

Grand Forks, N. D., March 21—A bill has been introduced in the state legislature which, it is believed, will prevent stolen cars from being sold in North Dakota. By its provisions every dealer in making a sale of a new car would furnish to the purchaser a statement as to the name of car, place where made, capacity and number, kind and number of engine. This would be signed by the buyer and sellers and acknowledged before a notary public. Subsequent sales would have to be accompanied by the original sales statement.

Used cars for which no previous sale statement had been furnished would bear a new sale statement from the seller to the purchaser, and thereafter the same procedure would obtain. Persons in possession of cars transferred since the act who have not complied with the requirements would be liable in damages to any person injured thereby to double the amount he may prove himself, in action at law, to have been damaged.

RECORDS TO PREVENT THEFTS

Philadelphia, Pa., March 21—The keeping of records by second-hand dealers in motor cars on lines similar to those used by pawnbrokers, whereby close check is kept on all transactions, with names and addresses of buyers and sellers, was urged at a meeting of the subcommittee on motor car thieving, of the State House of Representatives. A campaign is under way to stop widespread theft in Pennsylvania.

The meeting was attended by garagemen, representatives of insurance companies and dealers in new and used cars. Widely divergent views were expressed with regard to a bill introduced to regulate the sale of motor vehicles in the effort to cut down thefts. Miles Higgins, representing the Automobile Owners' Indemnity Association, urged that dealers in used cars be required to keep books showing the date of purchase, from whom bought and to whom sold, the books to be open at all times to police inspection. The plan also was suggested that where cars are offered for sale, dealers should ask the seller to show his license card with the number of the car and the license tag with a number corresponding to that on the card.

Tubing and Hose Sizes for Cars

Motor Age Maintenance Data Sheet No. 31

One of a series of weekly pages of information valuable to service man and dealer—Save this page

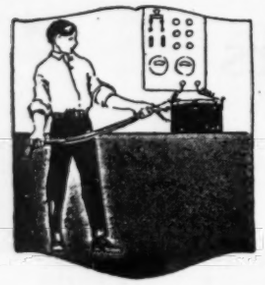
1916 Models

Car and Model—	Gasoline Tubing Diam.	Oil Tube Diam.	HOSE Diameter and Length (Upper)	HOSE Diameter and Length (Lower)
Allen—32-37	3/8	5/16	2 x 6	1 1/2 x 6 1/2
Apperson—6-48	5/16	..	1 1/2	1 1/2
Apperson—8-58	5/16	..	3	1 3/4
Biddle—D	5/16	..	2 x 7 1/2	1 1/2 x 7 1/2
Briscoe—4-38	5/16	5/16	2 3/16 x 8 1/4	1 11/16 x 5 1/2
Briscoe—8-38	5/16	5/16	2 3/16 x 6 3/4	1 11/16 x 4 1/2
Cadillac—53	.189	.243	1 1/4 x 8 1/2	1 1/4 x 5 1/2
Case—T	5/16	5/16	2 1/2 x 3 1/2	2 1/2 x 5
Chalmers—26-C	3/8	3/8	2 1/2 x 3	2 1/4 x 3 1/2
Chalmers—32-B	5/16	5/16	2 3/8 x 3	2 1/4 x 3 1/2
Chalmers—35-A	3/8	3/8	2 1/2 x 5 1/4	2 1/4 x 3
Chandler—17	5/16	1/2 & 1/4	1 3/8 x 9 5/8	1 3/8 x 9 7/8
Chevrolet—490	5/16	3/8	1 3/4 x 3 3/4	1 3/4 x 3 3/4
Chevrolet—F	5/16	5/16	1 1/4 x 7	1 1/4 x 4 5/8
Cole—860	5/16	5/16	1 1/2 x 18	1 1/4 x 3 3/4
Crow-Elkhart—All	1/4	3/8	2 1/4 x 8	2 1/4 x 15
Cunningham	5/16	1/4	1 1/4 x 5 1/2	1 1/4 x 3 3/8
Davis—Six-E	5/16	..	1 1/2 x 11	1 1/4 x 12 1/2
Davis—Six-F&G	5/16	..	1 1/4 x 11	1 1/4 x 12 1/2
Dixie Flyer—L	5/16	5/16	2 1/4 x 10 1/4	2 1/4 x 15
Dodge—All	5/16	3/8	6 1/2 x 1 3/4	6 7/8 x 1 7/16
Dorris—I-B-6	5/16	3/8-5/16-1/4	1 1/2 x 4 1/4	1 1/4 x 6 1/4
Dort—5-A	1/4	5/16	2 1/4 x 7 3/4	2 1/4 x 15 1/8
Ford—T	1/4	3/8	2 x 3 1/2	1 3/4 x 2 3/4
Franklin—Series 8-M	3/8	1/4	None	None
Grant—V	3/8	5/16	2 1/8 x 7 3/4	2 1/8 x 3 1/2
Haynes—34 & 35.	..	..	1 1/4 x 11 1/2	1 1/4 x 2 3/4
Haynes—34 & 35.	..	..	.....	To pump 1 1/2 x 8 1/4 To radiator
Hudson—40	3/8	1/4	1 1/2 x 7 5/8	1 1/4 x 7 1/2
Hupmobile—N	1/4	5/8	2 1/2 x 13	1 7/16 x 13 R & L
Inter-State—T	5/16	3/8	2 1/4 x 3 11/16	2 x 5 1/2
Jackson— 34	1/4	3/8	1 1/2 x 10	1 1/2 x 10
Jackson—348	1/4	3/8	1 1/2 x 10	1 1/2 x 10
Jackson— 68	1/4	3/8	1 1/2 x 8	1 1/2 x 12
Jeffery—462	5/16	5/16	1 1/4 x 6 1/4	1 1/4 x 8 1/2
Jeffery—472	5/16	5/16	1 1/4 x 8 1/2	1 1/4 x 8 1/2
Jeffery—661	5/16	5/16	1 1/2 x 12	1 1/4 x 4
Jones—22 & 25	5/16	5/16	1 1/2 x 11	1 3/16 x 11
KisselKar—4-36	5/16	1/4	1 1/2 x 8 1/2	1 1/2 x 11 1/4
KisselKar—6-42	5/16	1/4	1 1/2 x 6 3/4	1 1/2 x 8 3/4
KisselKar—4-32	5/16	1/4	1 1/2 x 5 1/2	1 1/2 x 8 3/4

Car and Model—	Gasoline Tubing Diam.	Oil Tube Diam.	HOSE Diameter and Length (Upper)	HOSE Diameter and Length (Lower)
Lexington—6-N	5/16	..	1 1/2 x 12	1 1/4 x 8 3/4
Lexington—6-O	5/16	..	1 1/4 x 12	1 1/4 x 8 1/2
Liberty—10-A	5/16	1/4	2 5/8 x 6 5/8 OD	2 5/8 x 12 3/8 OD
Locomobile—All	3/8	1/2	1 13/32 x 8	1 13/32 x 8
Marmon—34	3/8	3/8	1 1/4 x 3 3/8	7 1/4 x 3 7/8
McFarlan—All	5/16	5/16	1 7/8 x 9	1 1/4 x 4
Mercer—All	5/16	5/16	1 1/4 x 9	1 1/4 x 4 3/4
Mitchell—C-42	1/4	3/8	1 1/2 x 9 1/2	1 1/8 x 12 Rad'r to pump
Moline-Knight—50	3/8	5/16	2 3/4 x 7 1/2	2 3/4 x 7 1/2
Moline-Knight—40	5/16	5/16	2 1/4 x 5 1/2	2 x 6 1/2
Oakland—32	5/16	1/4	1 1/4 x 14 5/8	1 x 8 1/4
Overland—75	1/4	1/4	1 3/4 x 8	1 3/4 x 5 1/2
Overland—83	1/4	1/4 & 3/8	2 1/4 x 4 1/2	2 1/4 x 6 7/8
Owen Magnetic—				
M-25	5/16	5/16	1 1/2 x 6 1/8	1 1/4 x 7 3/4
O-36	5/16	5/16	1 9/16 x 10 1/2	1 9/16 x 8
Packard—All	3/8	1/4	1 1/8	1 5/8
Paige—H-2	5/16	5/16	1 13/16 OD	1 5/16 OD
Paige—G-2	5/16	5/16	2 1/16 OD	1 9/16 OD
Paterson—6-42	1/4	1/4	1 1/4 x 10 1/2	1 1/4 x 13
Peerless—56	5/16-3/8	5/16	1 1/4 x 6	1 3/4 x 4
Pierce-Arrow—C-3.	1/2	1/4 & 13/32	2	1 1/4
Pierce-Arrow—B-3.	1/2	1/4 & 13/32	2 3/8	1 1/4
Pierce-Arrow—A-3.	1/2	1/4 & 13/32	2 5/8	1 5/8
Pilot—6-45	5/16	5/16	1 3/4 x 10	1 x 7
Premier—6-51	3/8	1/4	1 1/2 x 6	1 5/16 x 3 1/2
Pullman	..	..	.....	.....
Reo—R & S	1/4	1/4	1	1
Reo—M & N	1/4	1/4	1 1/2	1 1/4
Stearns—SKL-4	5/16	1/4-5/16-1/2	1 3/8 x 6	1 3/8 x 9
Stearns—SK-8	5/16	1/4-5/16-1/2	2 1/4 x 10	2 1/4 x 10
Stephens—All	5/16	3/8	1 1/4 x 8	1 1/4 x 10 3/8
Studebaker—ED	1/4	3/16	1 7/8 x 8 3/4	1 1/2 x 5 1/2
Studebaker—SF	1/4	1/16	1 7/8 x 8 3/4	1 7/8 x 9 1/2
Studebaker—7	1/4	3/16	1 7/8 x 8 3/4	1 7/8 x 9 1/2
Stutz—C	3/8	5/16 & 3/8	1 1/2	1 1/2
Velie—22	5/16	1/4	1 1/4 x 9 1/2	1 1/4 x 10 3/4
Velie—15	5/16	1/4	1 1/2 x 9 3/4	1 1/4 x 9
Westcott—All	5/16	1/4	1 1/2 x 10	1 1/4 x 9
Willys-Knight—84.	1/4	1/4	2 3/4 x 3 3/4	2 3/4 x 7 1/4
Winton—22A	1/4	..	1 1/2 x 6	1 1/4 x 24
Winton—22	1/4	..	1 1/2 x 7	1 1/4 x 25 3/4

1917 Models

Allen—37	3/8	5/16	2 x 6	1 1/2 x 6 1/2
Apperson—6-17	5/16	..	1 1/2	1 1/2
Apperson—8-17	5/16	..	3	1 3/4
Biddle—H	5/16	..	2 x 7 1/2	1 1/2 x 7 1/2
Briscoe—4-24	5/16	5/16	2 x 5 1/2	2 x 5 1/2
Cadillac—55 *Inside.	.189*	.243*	1 1/4 x 8 1/2	1 1/4 x 6 5/8
Case—T-17	5/16	5/16	2 1/2 x 3 1/2	2 1/2 x 5
Chalmers—35-B	3/8	3/8	2 1/2 x 5 1/4	2 1/4 x 4 1/4
Chalmers—6-30	3/8	3/8	2 1/2 x 5 1/4	2 1/4 x 3
Chandler—17	5/16	1/2 & 1/4	1 3/8 x 9 5/8	1 3/8 x 9 7/8
Chevrolet—490	5/16	3/8	1 3/4 x 3 3/4	1 3/4 x 3 3/4
Chevrolet—F	5/16	5/16	1 1/4 x 7	1 1/4 x 4 5/8
Cole—860	5/16	5/16	2 x 18 1/2	1 1/4 x 3 3/4
Columbia—All	5/16	..	1 1/2 x 7 O	1 1/2 x 10 O
Crow-Elkhart—All.	1/4	3/8	2 1/4 x 8	2 1/4 x 15
Cunningham	5/16	5/16	1 1/4 x 5 1/2	1 1/4 x 3 3/8
Davis—Six H.I.&K.	5/16	..	1 1/4 x 11	1 1/4 x 12 1/2
Davis—Six J.&J.I.	5/16	..	1 1/2 x 11	1 1/4 x 12 1/2
Direct-Drive	5/16	None	2 x 6	2 x 10
Dixie Flyer—L	5/16	5/16	2 1/4 x 10 1/4	2 1/4 x 15
Dodge—All	5/16	3/8	1 3/4 x 6 1/2	1 7/16 x 6 7/8
Dorris—I-C-6	5/16	3/8-5/16-1/4	1 1/2 x 4 1/4	1 1/4 x 6 1/4
Dort—All	1/4	5/16	2 1/4 x 7 3/4	2 1/4 x 15 1/8
Douglas—G	5/16	1/4	1 1/4 x 8	2 1/4 x 6
Elgin—F	5/16	..	1 7/8 x 8 1/4	1 7/8 x 17
Ford—T	1/4	3/8 O	2 x 3 1/2	1 3/4 x 2 3/4
Franklin—Series 9-A	3/8	1/4	None	None
Grant—K	3/8	5/16	2 1/8 x 7 3/4	2 1/8 x 4 1/8
Haynes—40 & 41			1 1/4 x 8 7/16 to pump. 1 7/16 x 7 1/2 to rad'r bottom. 1 1/4 x 18 3/4 to rad'r top. 1 1/4 x 3 1/4 between blocks.	
Haynes—36 & 37			1 1/4 x 2 3/4 to pump. 1 1/2 x 8 1/4 to rad'r bottom. 1 1/4 x 11 1/2 to rad'r top.	
Hudson—H	13/32	5/16	1 1/2 x 5 3/4	1 1/2 x 9 1/4
Hupmobile—N	1/4	5/8	2 1/2 x 13	1 7/16 x 13 R&L
Inter-State—T	5/16	3/8	2 1/4 x 3 11/16	2 x 5 1/2
Jackson—All	1/4 & 5/16	3/8	2 1/2 x 8	1 1/2 x 10
Jones—26	5/16	5/16	2 1/2 x 11	1 1/2 x 12
Jordan—B	5/16	1/4	1 1/2 x 10	1 1/4 x 11 1/4
KisselKar—				
100 Pt. Six	5/16	3/8	1 1/4 x 9	1 1/4 x 9
6-42	5/16	3/8	1 1/2 x 6 3/4	1 1/2 x 8 3/4
Double Six	5/16	3/8	1 1/2 x 15 1/4	1 3/4 x 21



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.

Editor's Note—Herewith is presented the 139th installment of a weekly series of articles begun in MOTOR AGE, *issue of June 29, 1916, designed to give the repairman and motorist the knowledge which will enable them to care for and repair any and all of the electrical features of the car, no matter what make or model it may be.*

The first half of this series has been published in book form by the U. P. C. Book Co., Inc., 243-249 West Thirty-ninth street, New York, and is sold at $2.50. The remainder of the series will be published as a supplementary volume.

Part CXXXIX—Special—Remy Tractor System

NOTE if a flash occurs at the starter switch contacts when releasing the switch.

a—If it does not, or is very weak—that is evidence of a very weak battery or poor connections.

b—If a good flash occurs and the starter does not turn the engine, remove the commutator cover and see if the armature is free to turn with your finger.

c—If it is and the armature turns when the switch is closed, the trouble is, no doubt, due to heavy grease on the Bendix screw shaft, which prevents the pinion from going into mesh with the teeth in the flywheel.

d—The starter is not intended to crank the engine without first gathering a little momentum made possible by the time required for the pinion to travel into mesh with the flywheel gear teeth. Therefore, if you close the starter switch momentarily and the starter does not have time to turn one cylinder past compression, the Bendix pinion will very likely stay in mesh with the flywheel gear and the next time you try to use the starter, it will be trying to start with a dead load.

You would not think of starting the engine with the tractor in gear and the clutch connected, as the load would be too great. Therefore, do not try to start the engine with the Bendix pinion in mesh.

e—If the battery is nearly discharged and the lights are turned on, they will be dim when the starter switch is closed. The lights will also be dim if you try to use the starter when the Bendix pinion is standing in mesh with the flywheel gear.

If the battery is so low there is not enough current for ignition to start the engine, then proceed as follows:

1—Remove the line wire from terminal L under the generator cover and be sure the terminal does not touch any metal, thereby causing a ground.

2—Place the control on point 5 or 6.

3—Turn the ignition key to "on" position for daylight running.

4—Do not use the starter, but crank the engine by hand and do so as soon as possible after turning the switch on. If there is no trouble other than a low battery, the engine will start and run slowly until the line wire is replaced on terminal L, unless the battery is completely discharged, in which case:

a—Turn the switch to "off."

b—Replace the line wire on terminal L under the generator cover.

c—Connect three to five cells, depending upon their condition, in parallel with the ignition circuit from the terminal marked "switch" on top of the ignition coil to a convenient ground, preferably the circuit breaker control lever.

d—Crank the engine by hand.

5—As soon as the engine starts, turn the ignition key to "on" position and after the engine runs a few seconds, disconnect the dry cells, as the generator will furnish enough current for ignition and for charging the storage battery.

6—After having to crank the engine by hand, the engine should be run for about half an hour at a speed of approximately 675 r.p.m. to put a little life into the storage battery before trying to do actual work.

So long as you get good ignition and good governing, you can rest assured the battery is being charged, as it is the charging that does the governing.

Recharging the Battery

To recharge the battery quickly, without removing it from the tractor or running the engine fast, proceed as follows:

1—Place the control on point 1.

2—Turn the carbureter valve stop screw one full turn to the right.

a—The engine will then run approximately 675 r.p.m. and should be charging the battery at about 6.5 amp.

b—The generator should not be run for even an hour with an output greater than 8 amp.

Running the engine as suggested above for 2 to 3 hr. should bring the battery up to a point where it would operate the starter, unless it had been completely discharged, in which case 6 hr., or longer, may be required.

A loose connection anywhere in the line or a corroded battery terminal very likely will prevent recharging of the battery and cause overheating of generator and possible damage, in which case it will soon become discharged.

After recharging the battery, be sure to return the screw to original position to avoid injuring the storage battery or other equipment.

The ball joints in the linkage between the carbureter and the governor lever should work freely. Therefore, they should be kept clean and be oiled often to prevent rusting.

Testing the Generator

To test the generator, put an ammeter in series with the battery by disconnecting the line wire from terminal L under the generator cover and connecting it to one side of an ammeter. Then run a wire from the other side of the ammeter to terminal L.

If after making these connections the ammeter hand shows charge with the switch on and the engine not running, you will know that the wires on the ammeter should be reversed.

If the ammeter does not show a discharge of about 15 to 20 amp. when the engine is not running and the switch is turned to "on" or "run" with the control on point 1, look for the following:

1—A weak storage battery.

2—A corroded storage battery terminal.

3—A ground or short-circuit in the starting motor switch or

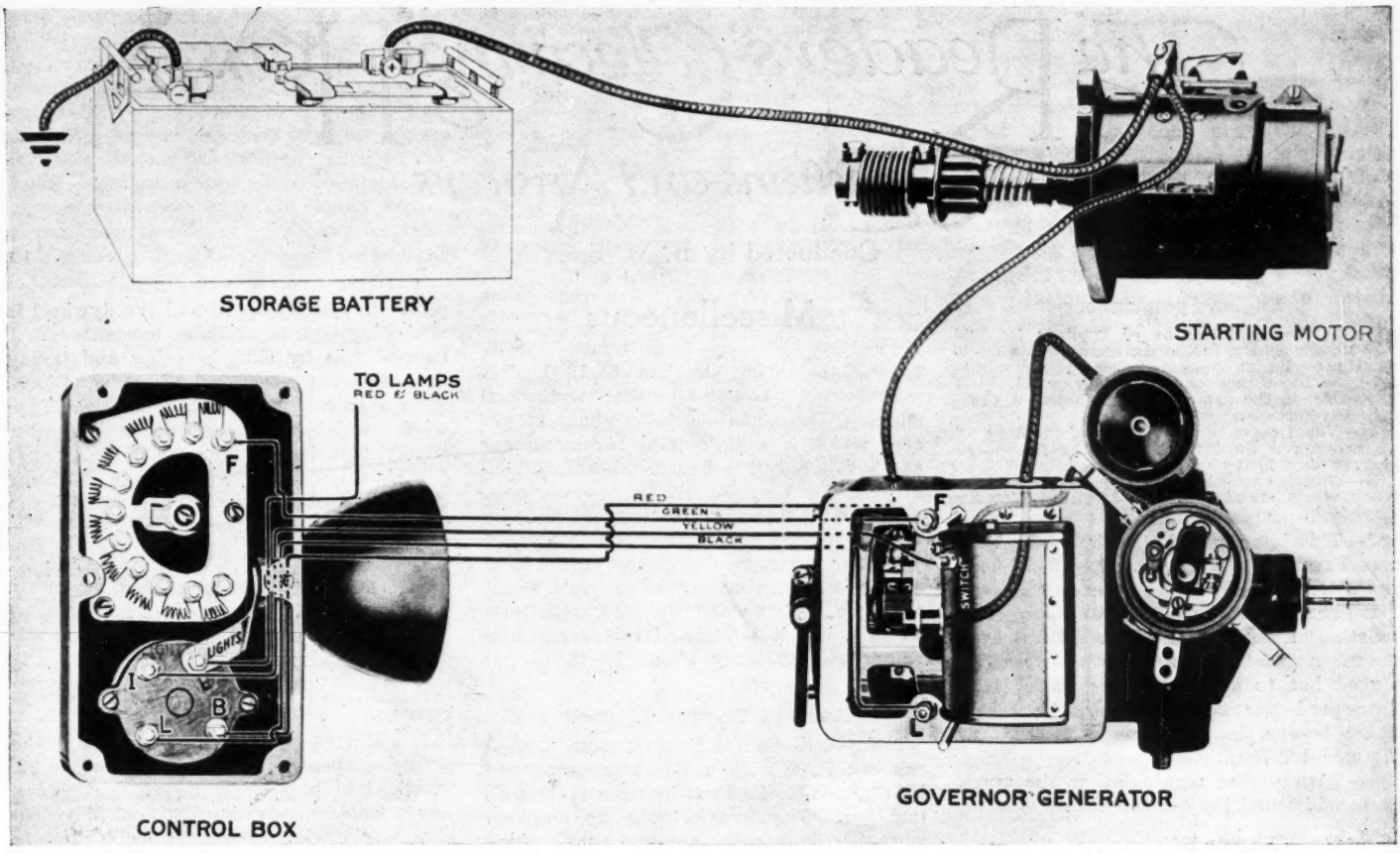


Fig. 696 E—Connections of Remy electric installation on Moline-Universal tractor

somewhere in the wiring between the ammeter and the storage battery.

4—A poor ground or poor connection between the control box and the tractor frame or in the wiring.

5—Poor contact between the control handle and the control box or the contact spring and the contacts to which the rheostat resistance is connected.

6—Loose or dirty connections at the terminal posts in the control box, starting motor switch, under the generator cover or where the wire is soldered to a terminal.

7—If all but a few strands of the wire are broken off at the terminal, a new connection should be made and soldered.

8—Sometimes all or most of the strands of wire are broken inside of the insulation at a point where the wire is subject to much movement. This condition can usually be determined by feeling the wire. In such cases, the wire should be cut at the point where it is bad, cleaned well, twisted together, soldered and taped well or a new piece of wire used with terminal properly resoldered.

9—A poor contact in the combination lighting and ignition switch. If the discharge rate is much more than 20 amp., look for the following:

a—Broken down insulation at terminal post "L," due to a crack in the insulation, dirt or the insulating bushing being out of place, causing a short circuit.

b—Line, insulated, brush or leads connected to it may be shorted.

c—Grounded or shorted field.

If the discharge rate does not decrease as the control is turned toward point "Fast" and stands at about 15 to 20 amp., you can be sure that the trouble is due to short-circuit somewhere between the field winding where it is connected to post F under the generator cover and post F inside of the control box.

CLOVERLAND DEALERS ORGANIZE

Escanaba, Mich., March 21—The Cloverland Automotive Dealers' Association was organized here yesterday as the outgrowth of a movement started during the Milwaukee show, Jan. 24-30, when dealers of the Upper Peninsula of Michigan formed a temporary organization at a meeting of more than 150 dealers. The purpose of the new association is not only to promote the mutual welfare of members as dealers but to boost the general progress of Cloverland, as Northern Michigan is known.

Officers of the new association were elected as follows: President, John H. Knutsen, Escanaba; first vice-president, Ned Watson, Marquette, Mich.; second vice-president, Nelson Johnson, Manistique, Mich.; secretary, George G. Geniesse, Escanaba; treasurer, E. J. Kingsford, Iron Mountain, Mich.

The Delta County Automotive Dealers' Association acted as host to the dealers and gave a banquet at the close of the convention. It was largely responsible for the unusually large representation of Peninsular dealers at the Milwaukee show in January and initiated the effort which has resulted in the formation of the new association.

U. S. TRACTORS FOR FRANCE

Charles City, Iowa, March 21—An order aggregating more than $300,000 was placed with the Hart-Parr Co. during the Kansas City tractor show for delivery during this year. The order called for 200 tractors to Beauvias & Robin of Angers, France, and five tractors were crated and started at once.

BAD ROADS HALT MAILS

Memphis, Tenn., March 21—All arrangements for establishing four motor truck rural mail routes out of Memphis had been made when an adverse report on the condition of the roads over which the trucks were to operate killed the project.

The postoffice inspector who examined the routes reported that the condition of the roads was such that they would not carry the service one year and refused to recommend the routes. Four U. S. trucks were ready for shipment here to be used on the routes when notice was received from the postmaster general's office that the service would not be established on account of road conditions.

It was proposed to devote the motor routes to the parcel post transportation of vegetables, poultry and farm products to Memphis markets.

The Readers' Clearing House

Questions and Answers

Conducted by B. M. Ikert

Engine Specifications

Q—In the specifications of tractors Dec. 26 MOTOR AGE gave the Aultman-Taylor 30-60 as a four-cylinder opposed engine. Is this a mistake, or have they changed their model as I have one of the same size, which has a four-cylinder horizontal engine?

2—Would there be any danger of twisting off an axle on a Ford truck by using four-speed gearset on a heavy pull or in a mudhole?

3—Would one have more power than the truck would stand?—J. W. Haseltine, Cawker City, Kan.

1—This is no mistake as the 30-60 Aultman-Taylor is a four-cylinder opposed horizontal engine.

2—There would hardly be any danger of twisting off an axle on the Ford truck even though a greater gear reduction were employed but to our knowledge there is no four-speed gearset made for the truck. There is one, however, manufactured for the model T Ford.

3—With proper manipulation the truck parts will stand the extra strain.

Engine Efficiencies

Q—Explain thermal efficiency as regards gasoline engines.

2—What is Kelly metal, and could it be used for bearings in Ford engines, on connecting rod lower bearings, crankshaft bearings and on transmission drum bushings?

3—What is the approximate volumetric efficiency of a Ford engine at 1200 r.p.m.?

4—What is the volumetric efficiency of this engine when equipped with a Roof sixteen-valve cylinder-head at same speed?—William B. Wheatley, Charlotte, N. C.

1—Thermal efficiency as related to gas engines or any heat engine is based on the ideal Carnot cycle and is represented in the formula:

$$\text{Efficiency} = \frac{T_1 - T_2}{T_1}$$

Where T_1 is the maximum temperature within the cylinder, amounting to about 3000 deg.

T_2 is the exhaust temperature of the gases, amounting to about 1000 deg.

From this it can be seen that the thermal efficiency of a gas engine is about 20 per cent which is a high value for motor car use and is only reached in laboratory conditions.

2—Kelley metal is a secret alloy made by the Kelley Metal Co., Los Angeles, Cal.

3—The volumetric efficiency of the Ford engine is approximately 60 per cent.

4—We have no definite data from tests on this, but it is claimed to increase the volumetric efficiency about 10 to 15 per cent.

Miscellaneous

Removed Flywheel Magneto

Lafayette, Col., Editor MOTOR AGE—I run my Ford with a Bosch magneto and have removed the Ford ignition system altogether. The flywheel has no magneto and the field coils are removed, which makes the flywheel about 15 lb. lighter, and I have wonderful power climbing hills on high gear. I made the record of climbing Lookout mountain near Denver on high at the rate of 15 m.p.h. without stopping, but it was necessary to slow down to 5 m.p.h. to make the turns. It was necessary for the car to pick up speed immediately to make the grades. My success in power was due to the light flywheel and the Bosch magneto. The engine gets plenty of oil. Oil has the same level as if the magnets were on the flywheel.

I have had many arguments about the lighter flywheel proposition. Many people have the idea that it is necessary to have a heavy flywheel to gain power but do not stop to consider that it also takes power to move a heavy flywheel, especially when it moves slowly. This is when we want power to pick up speed and the flywheel is absorbing it to produce momentum. I learned this by experimenting and trying it on different machinery. I prefer to have it in a small diameter and have the face wider, which will speed up in a shorter time than a larger diameter will. If anyone should want to try it on a Ford car they can be safe to get plenty oil with the flywheel when the magnets are removed.—George L. Vette.

Resetting Hupmobile Springs

Q—The rear spring of my 1914 Hupmobile 32 is weak and lets the body down on the rear axle when going over rough roads. How can I fit a cantilever or platform spring under the rear of this car? I have tried in vain to strengthen this with shock absorbers.—H. T. Ballah, Clinchburg, Va.

It will not pay to attempt to redesign the spring suspension on the Hupmobile 32. It might be possible to install cantilevers, but it would require a great deal of expensive work, whereas your difficulty easily can be overcome. First have the whole spring reset, with considerably more arch to it, and at the same time either have a heavier main leaf put in or, still better, add a leaf above the main leaf and extending almost to the spring shackle on either end. This was the remedy followed by the writer, and no trouble has been found since. This, of course, will make the car ride just a little harder. At the same time add snubbers all around—particularly in the rear—and you can increase the speed over rough roads at least 25 or 30 per cent.

Adjusting Steering Gear

Q—How can slack be taken up on steering gear of Paige G 2-6-46?

2—How can I dismantle steering gear?—Walter J. Owens, Washington.

1—This is the Jacox steering gear and probably is the easiest made to adjust and keep in adjustment owing to its construction. It has a substantial steel worm inclosed by a semi-steel nut which is split into halves, Fig. 1. The worm is double threaded, both right and left hand, so that turning the wheel causes one half nut to rise and the other to fall. The ends of the nuts bear upon a rocking yoke, connected to the external steering arm. A single adjustment is made wherein a nut backs the ball thrust race and takes up the wear. Loosen the clamp bolt shown above the grease plug and then with a wrench turn to the right the large hexagonal nut, which will push down the thrust bearing and set down the worm against the faces of the threads in the half nuts. Then fasten the clamp bolt securely. If there is not enough play in the steering wheel, the hexagonal nut if turned to the left will loosen the mesh of the gears. Give the steering wheel about an inch of movement at the rim.

2—It should not be necessary to take down this gear. The writer has used the same one for five years and it is as good to-

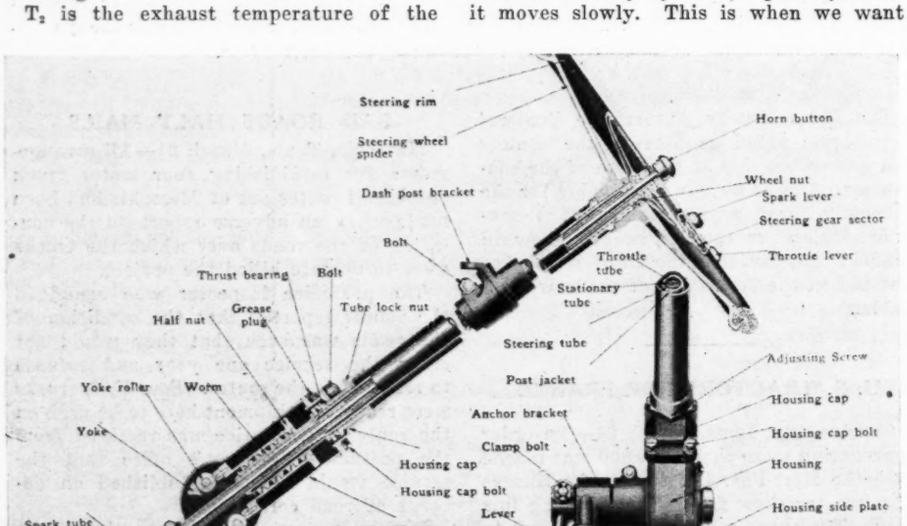


Fig. 1—Cross-section of Jacox steering gear used on Paige, with adjustments

day as the day it was put in. But there is one thing to look out for—that the steering lever that connects the drag link is drawn up perfectly tight on the squared end of the steering gear shaft, otherwise a considerable amount of play will be developed and the car will not hold to the road. The steering gear can be taken down by taking out the bolts that hold the two parts of the casing together, a simple and easy process. Of course, the whole affair should be removed from the frame to accomplish this. But, as said before, there should be no need to take it down.

Engine Details and Speeds

Q—Is the engine of my 1918 Oldsmobile six equipped with only two rings to the piston, or has it four? Thus far, after 2500 miles of driving, it has not given any carbon trouble worth mentioning, and I ran about 1000 miles without plug trouble. Oil gives about 150 miles a quart.

2—Is there any way to forestall oil pumping if an engine is inclined that way?

3—Publish a horsepower chart of the Northway six engine used in this car.

4—I observe that horsepower and speed, contrary to popular belief, are not necessarily in proportion in cars. As to performance, such low-rated cars, S. A. E., as the Hupmobile, Templar, Essex, Mercer, Olds six and Oakland six all will give approximately 60 m.p.h. under favorable conditions and a few of them even better. This is better than many larger cars of much higher power will do in the way of speed, even under favorable conditions. I have seen several disappointments experienced by owners of large cars on the local tracks, when they were unable to get even 55 m.p.h. Is this due to weight or to design for slow work, saying that the cars are in good condition and tuned up?

5—Have four-cylinder cars any special advantages in speed? I note the Stutz is credited with a speed of 75 m.p.h., while the Revere advertises to make 85 m.p.h. with its stock model.

6—This is faster than most sixes, eights and twelves built for stock, is it not?

7—Is a speed of from 45 to 50 m.p.h. about what could be expected from most cars in the hands of owners, under average road conditions when in fair shape?—Howard T. Dimick, Shreveport, La.

1—The earlier models had two rings, but those of recent date have been fitted with three rings. Not knowing the exact age of your car it is impossible to tell which model it is and how many rings are used. If you have run 2500 miles it is likely the carbon should be burned out of the cylinders. Running 1000 miles without plug trouble is fair and yet nothing exceptional; many cars go a season without the plugs being touched. Still, there are many that give a lot of annoyance long before 1000 miles have been covered. You are about right on oil consumption; perhaps since the engine has been worked in you can get along with less, in the neighborhood of 800 or 900 m.p.g. But take no chances. It is better to use a little too much oil and have carbon than not enough and have to have the cylinders reground, new pistons fitted and perhaps require new bearings. Better leave the oil alone.

2—Why attempt to cross the bridge until you come within sight of it, at least? You are doing pretty well; let the engine alone.

3—This is not available.

4—Speed is one of those peculiar elements that nobody can tell anything about. It all depends. Race drivers are able by adjusting and tinkering to increase the speed of their mounts very materially. So far as what different cars can do, it is largely the relation of weight to power, assuming that all other things are equal. Valve timing, gear ratio, ignition timing, size of valves, size of carbureter and manifold, the pooling system—all have a bearing on speed. There is no use in making comparisons. For instance, a Ford has been known to be rigged up and tuned to do better than 80 m.p.h. By being worked on and groomed any car can be made to be pretty fast. One car is made to be speedy, another to be powerful and comfortable. The owners of most cars would be disappointed if they were to try out their machines on a track where accurate timing can be had. Speedometers are not always right, and a driver going 55 m.p.h. cannot watch the instrument, so he is apt to fool even himself.

5—Fours have the advantage of fewer parts to go wrong and carburetion and ignition can be better. In a four it is customary to use a high-tension magneto, which unquestionably gives better results for racing than does the battery system. Many fours can go better than 100 m.p.h. on the track, but it must also be remembered that it was a twelve-cylinder car that de Palma used in breaking all the straightaway records on the beach near Daytona, Fla. Four-cylinder engines have for a long time been developed to a greater extent than sixes, eights and twelves, particularly for racing, but the engines with more cylinders have received far greater attention the last few years and have advanced materially, notably in airplane work, and an airplane engine is practically the same as that used in a motor car.

6—Yes, but most of these could be made to go 70 to 80 m.p.h. There is a limited field and a limited demand for cars that can travel at such speeds, and inasmuch as they cost more to build—because they are called upon to stand more strains—most makers prefer to confine their efforts to making something the market will absorb more readily.

7—From 45 to 50 m.p.h. is pretty fast for a good driver on a good road with a car in good shape—and too fast in most instances. It requires a straight, smooth road to hold a car on it at 50 m.p.h., and it takes an experienced driver to handle a car at such speeds for any great distance. It is too fast for the average man and too fast to be safe.

To assist readers in obtaining as a unit all information contained in this department on a certain subject MOTOR AGE segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.

MISCELLANEOUS

J. W. Haseltine.....Cawker City, Kan.
W. B. Wheatley.....Charlotte, N. C.
George L. Vetter.....Lafayette, Col.
H. T. Ballah.....Clinchburg, Va.
Walter J. Owens.....Washington
Howard T. Dimick.....Shreveport, La.
W. J. Jameson.....Cascade, Idaho
A. S. G.....Green Bay, Wis.
Clarence Collings.....Armington, Mont.
Andrew N. Planer.....Milwaukee, Wis.

THE ELECTRIC SYSTEM

Robert Kellams.....Rockport, Ind.
Walter J. Owens.....Washington
A. C. Gunderson.....Newell, S. D.
T. E. Thompson.....Newman, Ill.
J. G. Watt.....Wanatah, Ind.
Reader.....Belden, Neb.
R. S. Chamberlain.....Romero, Tex.
C. J. Bezolet.....South Germantown, Wis.
Henry Collins.....Boston, Mass.
Guy N. Walker.....Hillsboro, Tex.
Mark L. Hershey.....Reading, Mich.
J. C. Morton.....Bridgeport, Conn.
C. Gunderson.....Newell, S. D.
W. J. Roberts.....Ishpenning, Mich.
F. O. Crosby.....Toledo, Ohio
Julian L. Nugent.....Dayton, Wyo.
A. R. Morse.....Wagner, S. D.
W. C. Parish.....Southwest City, Mo.
James Messer.....Tallahassee, Fla.
J. I. Kinder.....Sharpsburg, Pa.
H. O. Denhart.....Ransom, Ill.
N. L. Medberry.....Brown Valley, Minn.
J. C. Freed.....Teegarden, Ind.
Charles A. Barker.....El Paso, Tex.

ENGINES

C. J. Almquist.....Del Valle, Tex.
George L. Vette.....Lafayette, Col.
Fred P. Steinmetz.....Chandler, Ind.
H. P. Murphy.....Chicago
H. C. Buttrick.....Muskegon, Mich.

LUBRICATION

C. F. Meier.....Bouton, Iowa
Angus Ross.....Wesington, S. D.
Walter J. Owens.....Washington
J. T. Lowe.....Plankinton, S. D.

CARBURETION

Louis Hagidom.....Hardwick, Minn.
Louis Hagidom.....Hardwick, Minn.

REBUILDING

R. L. McClure.....Danville, Ill.
L. P. Forby.....Fort Smith, Ark.
Fred S. Travis.....Defiance, Ohio
Robert F. Redinger.....Gardner, Kan.

No communication without the writer's name and address will be answered in these columns.

Play in Rear Axle

Q—The driveshaft of my Oldsmobile 44 has developed considerable play at the forward universal and some backlash at the rear end. It appears to be more in the differential than in the rear universal. What would be the proper way to make these adjustments?—W. J. Jameson, Cascade, Idaho.

Backlash may be caused by several things besides those mentioned, including the splined portions of both the driveshaft and the drive axles, to say nothing of transmission gears and those incorporated in the differential. Fig. 2 shows the make-up of the rear. It is probable the pinion needs adjustment. This may be accomplished by turning the pinion adjustment, after loosening the locknut on the outside of the third member of the housing, or that portion bolted to the rear axle housing proper. This easily will be located at a point back of the rear universal. This adjusting member

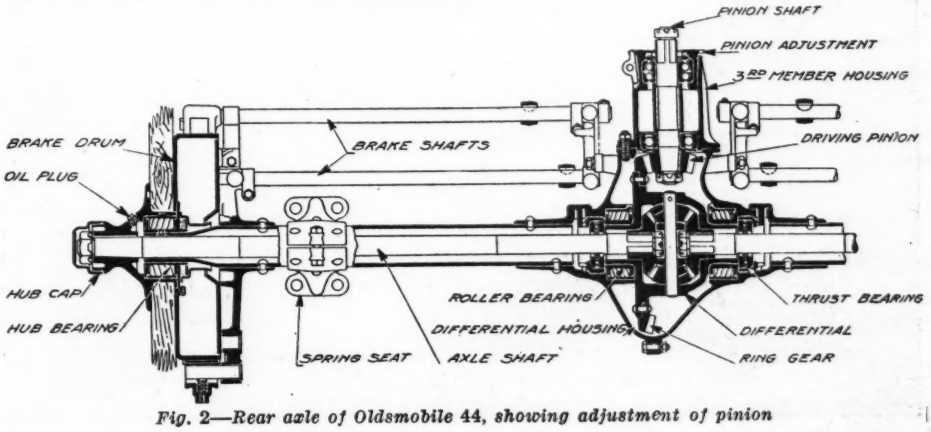


Fig. 2—Rear axle of Oldsmobile 44, showing adjustment of pinion

should be turned to the right to set the pinion gear closer to the ring gear.

It may be possible the thrust bearing on the left side of the differential will have to be turned slightly to throw the ring gear into closer relation with the pinion. This is not likely but should be looked after. The edges of the shoulders of the ring gear and the pinion should be exactly even. After the adjustment has been made and the parts locked as originally found, there should be just a trace of play between the pinion gear and the ring gear. Some mechanics make a practice of turning the pinion by hand and running between the gears a thin piece of paper, about the thickness of a cigaret paper, or possibly two of them. If this passes through without being obliterated and still so the teeth marks will show, it is a pretty safe adjustment.

If there is play in the universal joints, it will call for new bushings, and if there is play where the splined portion of the driveshaft enters the universal joints, it probably will call for a renewal of both shaft and universal sides. This applies also to the axleshafts where they slip into the differential.

Axle Thrust Washers

Q—The thrust washers in the rear axle of my 1917 Chevrolet 490 do not seem to be strong enough to hold the bevel ring gear and bevel pinion in mesh all the time. The thrust washers seem to wear out very soon. I keep plenty of steam cylinder oil in the differential gearcase all the time. It is full to the filler plug all the time.

2—What company makes a worm bevel ring gear and a worm bevel pinion that will fit the Chevrolet 490 differential gearcase?

3—What company makes a ball thrust washer for the Chevrolet 490 differential gear besides Bailey?—Clarence Collings, Armington, Mont.

1—You may be using washers that are too small or, rather, too thin. If you are using, say, shims 0.005 in. thick, they will not hold up; you should be using one 0.015 in. thick. With this, if the axle is assembled properly and aligned correctly, you should have no trouble.

2—To use a worm gear the axle housing must be especially designed for it and this is not the case with this one. Worm gears seldom are used on cars. It is probably you mean helical gears, but none is made in this type to fit the Chevrolet 490 model so far as is known.

3—F. H. S. & Co., 624 South Michigan avenue, Chicago.

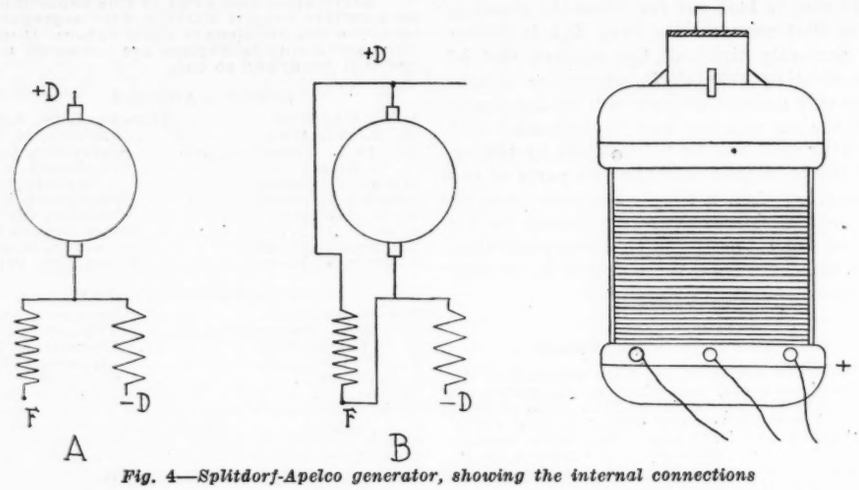


Fig. 4—Splitdorf-Apelco generator, showing the internal connections

Car Vibrates Excessively

Q—I have a model R Hupmobile driven 3000 miles. Up to 20 m.p.h. this car runs very smoothly, but whenever it goes over 20 m.p.h. the car vibrates. At 30 m.p.h. it is very annoying and uncomfortable. It is impossible to drive beyond this for fear of the car going to pieces. The smoother the road the more it vibrates. The car has been looked over, and everything seems to be tight. Can you suggest a remedy?—Andrew N. Planer, Milwaukee, Wis.

After thoroughly inspecting the car and all working parts seem to be functioning properly, there is but one thing which would cause the trouble referred to—an unbalanced flywheel or a misaligned clutch. Test for the unbalanced flywheel in this manner: Start the engine and let it run idly for a few minutes until it is firing evenly. Notice whether there is any vibration of the engine when it is turning over at a crankshaft speed which would propel the car 12 to 15 m.p.h. There will be some, of course, but note just how much by resting the hand on the engine or the front fender. Then speed the engine up to a rate equal to 25 or 30 m.p.h., taking particular note of the vibration set up. If it increases and coincides with the vibration on the road, it is likely the flywheel is out of balance. If nothing is found in this test, jack up the rear of the car and shift the transmission into direct speed, following the same course. If the vibration is now located, it is evidently due to the misalignment of the clutch.

Using Higher Gear

Q—What speed is it possible to get out of a 1914 Stutz with 15-tooth pinion and 49-tooth ring gear, 34 by 4½ tire, no windshield or top, low cut?

2—Would it be possible to drive this car in the country with 18-49 ratio?—A. S., Green Bay, Wis.

1—At least 60 m.p.h. or even better.

2—It would be possible, of course, but not advisable. The car would have great speed, but it would not throttle down in traffic and it would be hampered when climbing hills or pulling through mud. You would only have occasional opportunity to use the high speed, whereas you are apt to run into roads that will require power any time. You would sacrifice one for another and you would find that you could not get away as fast with the higher gear. If you are to use the car for racing purposes, the higher gear ratio will be advisable.

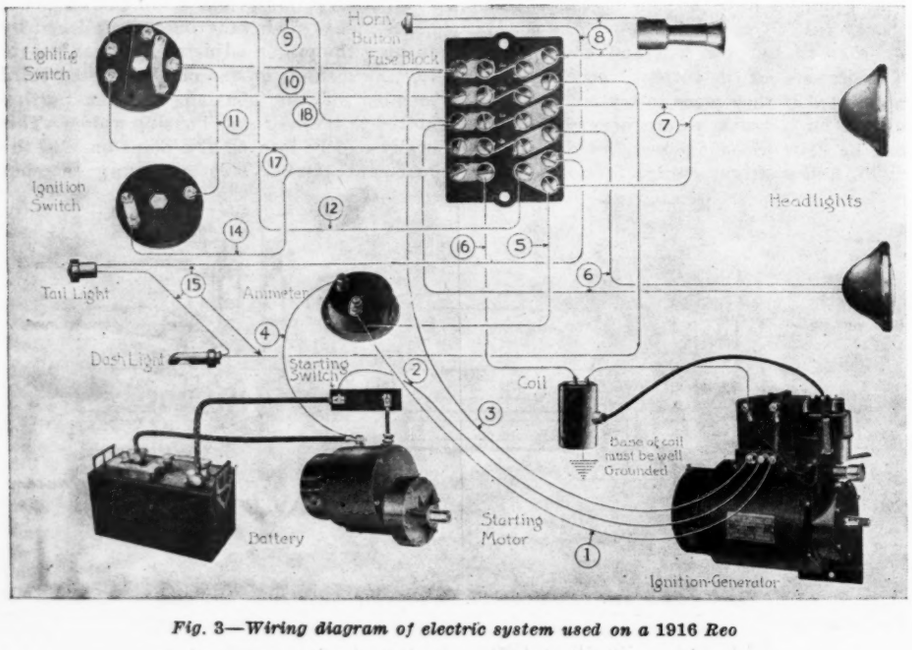


Fig. 3—Wiring diagram of electric system used on a 1916 Reo

The Electric System

1916 Reo Wiring

Q—Publish wiring diagram for a 1916 Reo, model R touring car.—Robert Kellams, Rockport, Ind.

This is shown in Fig. 3.

Removing Battery from Car

Q—If the storage battery is removed from my Paige G 2-6-46, can dry cells be substituted for a week or ten days? If so, how many?

2—What effect would this condition have on generator?—Walter J. Owens, Washington.

1—Not for starting and lighting. For ignition, use four.

2—You had better put in another battery temporarily.

Wants Testing Outfits

Q—Is there a gage on the market which tells the temperature of babbit, so as to tell at all times how hot the babbitt is when melted?

2—Who makes the best electrical tester for finding quickly shorts, generator troubles, etc., on all makes of cars and trucks?—A. C. Gunderson, Newell, S. D.

1—Yes. It is made by Leeds & Northrup, Philadelphia.

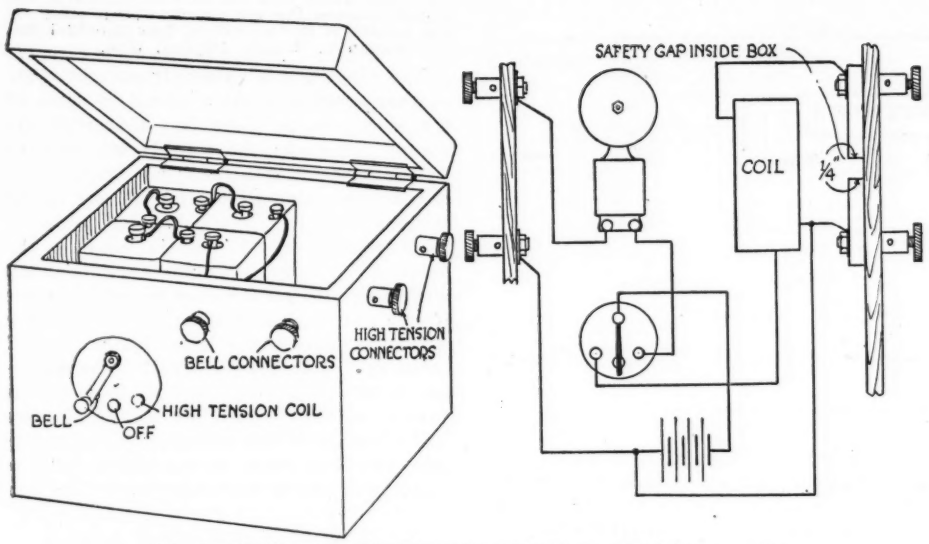


Fig. 5—Testbox for batteries, using material suggested by a reader

2—The Ambu, made by the American Bureau of Engineering, Chicago, is the only device of this kind we know of.

Apelco for Motor-Generator

Q—I have an old Apelco motor-generator, type A 7-5, 24-volt, which I want to run as a motor. Show wiring diagram of this and also as a generator and motor-generator.—T. E. Thompson, Newman, Ill.

This generator is of the differential type, that is, the series field opposes shunt field. The generator is shown in Fig. 4, with the internal connections. The original internal connections are shown at A. To change the motor so that it will operate separately from the car, the shunt field winding will have to be reversed as at B. This will allow the motor to work as a compound motor with constant speed characteristic, under varying load conditions. As a generator, it will operate compound also, giving constant voltage at varying loads, providing the speed remains approximately constant. When these connections are made the machine will operate as a generator or a motor depending upon whether it is driven or supplied with current.

Ford Wiring

Q—Publish wiring diagram of a Ford which has a taillight, spotlight, headlight and dashlight from Ford magneto.
2—What is the proper voltage of each bulb?—J. G. Watt, Wanatah, Ind.

1—This was shown in the Jan. 30 issue, in the series of wiring charts.

2—Use 12-volt bulbs. If the dashlight is put in series with the taillight, these two bulbs should be 6 volts each.

Cannot Charge Batteries

Q—I have a 1912 or 1913 Cadillac equipped with a Delco electric system, single-unit motor and generator with four binding posts. Show how I can connect this generator for charging storage batteries. How many 6-volt batteries can be charged at once? The equipment is 24-volt.—Reader, Belden, Neb.

The generator is designed to charge its own battery only. You could not expect good results by attempting to use it for charging several batteries at once.

Wiring Taillamp

Q—Can I wire the taillight and dashlamp of a 1915 Dodge Brothers car in series and still be able to light the headlights and taillights without the dashlamp? The switch is a three-gang, and I cannot light the taillight except when the headlights and dimmers are lit. Show how this can be done?—C. J. Bezolet, South Germantown, Wis.

If the dashlamp is in series with the taillamp, the latter cannot be operated without burning the dashlight.

Battery Needs Attention

Q—I installed a USL battery in my five-passenger 1917 Briscoe. It has 50 percent overcharge but does not give any results.—R. S. Chamberlain, Romero, Tex.

One or more cells are injured—buckled or sulphated. Have the battery overhauled.

Hot Bulb Ignition

Q—Give details of ignition of hot-bulb engine.—Guy N. Walker, Hillsboro, Tex.

A hot-bulb engine cannot be started until the bulb, which is located in direct contact with the exhaust, is heated with a blow torch. After the engine is started the exhaust gases keep the hot bulb at a temperature that will ignite the gas when the heat of compression is at its maximum.

Jumper on Pierce-Arrow

Q—Publish a wiring diagram of the ignition and starting system on the Pierce-Arrow model B-4.
2—I locked the switch recently and left the car standing in the street. Upon returning to go home I found I had lost the key so I had to get a man from the service station to get the engine started. He did so, after connecting some wires behind the dash. Could you indicate what wires he connected on the diagram?—Henry Collins, Boston, Mass.

1—The diagram for this model is shown in Fig. 6.

2—There are two switches that can be shunted out allowing the current to pass. One is by connecting across the terminals of the dash switch. The other is to connect across the two terminals shown joined by a dotted line.

Battery Test Box

Q—Publish instructions for making a practical electrical testing box. I would like to use a Ford coil unit, a small electric bell and four dry cells.
2—Can the coil be connected up to run a car that has a broken-down coil or a high-tension magneto that is out of commission?—Mark L. Hershey, Reading, Mich.

1—In Fig. 5 is an illustration of a test box using the material you mention. The bell is for testing out for shorts and grounds and the coil for spark plugs and the high-tension system.

2—Any high-tension coil can be made to work if enough readjusting to meet the special conditions is done. Connect the common connection of the coil to the ground. The low connection to the battery and the high connection to the center of the distributer. This holds for all cases.

1915 Buick Diagram

Q—Publish wiring diagram of 1915 Buick C 24.—J. C. Morton, Bridgeport, Conn.

This was shown in the Jan. 16 issue of MOTOR AGE.

Ford Magneto Questions

Q—Explain what is meant by alternating current in a Ford magneto.
2—Explain how the magnetism flows through the coils and how the magnets are set on flywheel.
3—Explain how the high-tension current gets back to the coil from the spark plugs.
4—Explain how a high voltage is produced with a Ford magneto when in its best condition, engine running at 1000 r. p. m.
5—What is the least voltage it will run on?
6—How much weight should a magnet hold when at its best?
7—What is the least voltage it needs to properly jump the spark plug gap at full load of engine?—C. Gunderson, Newell, S. D.

1—Alternating current in Ford magneto, or any other form of alternator, is just what the name implies, alternating current. Direct current is unidirectional current that

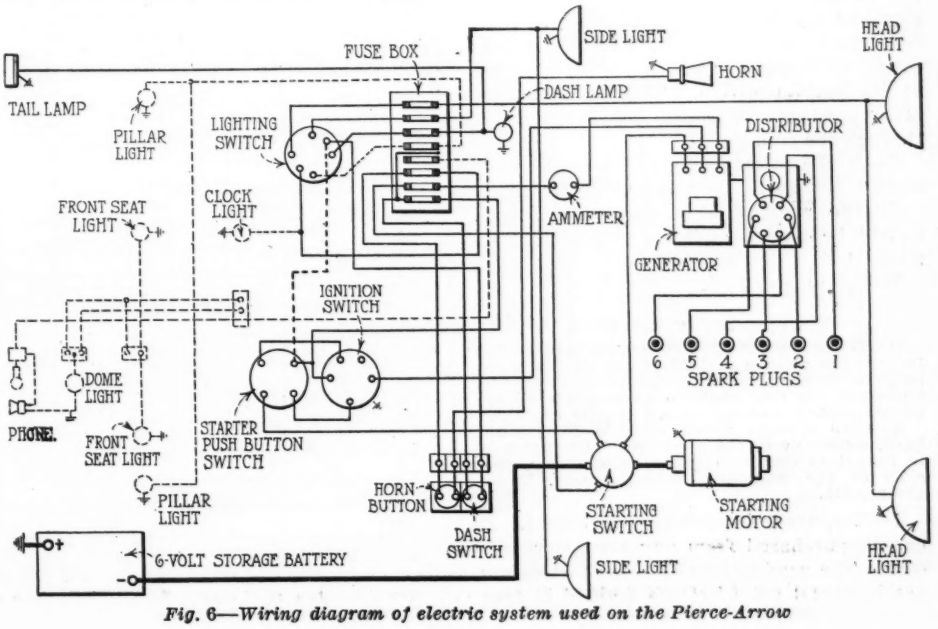


Fig. 6—Wiring diagram of electric system used on the Pierce-Arrow

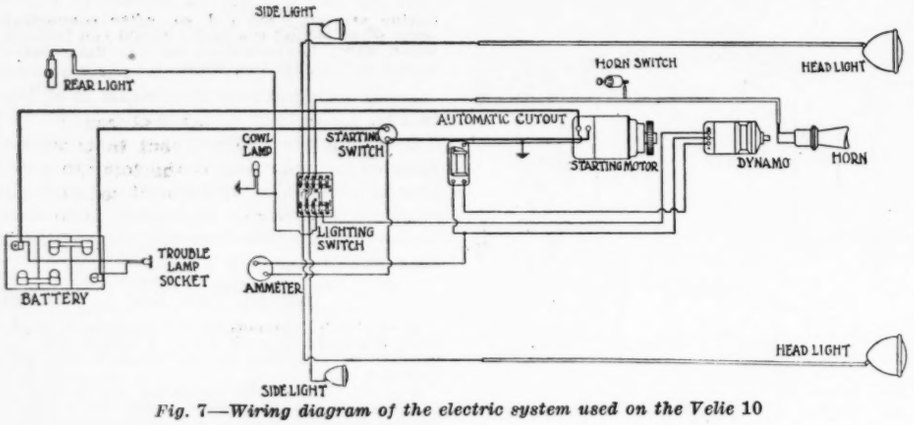


Fig. 7—Wiring diagram of the electric system used on the Velie 10

flows always in the same direction, that is, the positive wire remains positive always and the negative wire remains negative always. In an alternating current circuit the current flow is reversing constantly, and the rate of reversal is the cycle rate of the current. For example, we say 60-cycle A. C., which means that the current reverses itself or makes sixty complete forward and backward changes a second. In a Ford magneto an alternating current is generated because the coils, which are stationary, have their windings cut by the magnetic flux of the field magnets, which revolve. First one coil is cut by the flux and then the other, but the second coil has its winding in the opposite direction and therefore the current will flow in the opposite direction. If a commutator were applied, instead of taking the current off as it is generated, the alternating current could be changed to a direct current.

2—The magnetism does not flow through the coils, but the alternating current generated as a result of the magnetism cutting the coils does flow through the coils. The magnets are fastened to the flywheel by the magnet clamps and the nuts, which are fastened at the inner portion of the wheel and held there by the wire which goes through the hole in these nuts.

3—The high-tension current gets back to the coil by the common ground path. After jumping across the spark plug the current goes to the frame of the car and then to the common wire which leads to the high side and the low side of the coil.

4—An e. m. f. of about 15 volts is produced by the Ford magneto when running at its best condition. This voltage then is stepped up to 10,000 or 15,000 volts through the coil.

5—If the primary voltage becomes very much less than 15, the engine will misfire.

6—The magnet when properly charged should be able to lift its own weight or about 1 lb.

7—See answer to 5.

Voltage Tester for Ford

Q—Is there an instrument on the market for testing the voltage and amperage of the Ford magneto at cranking speeds? What voltage is necessary for this magneto to generate to explode properly a charge of low-gravity gasoline?

2—Give reasons which make a Ford start hard, especially in the morning. The engine is in first-class condition with the exception possibly of the magneto.—James Messer, Tallahassee, Fla.

1—Yes, there is such an instrument. It can be purchased from any accessory concern. The graduations of these testers are not in actual volts but are divided in four sections of the dial—poor, medium, good and excellent. Excellent indicates that the magneto is generating 18 volts or more at ordinary speed and will permit starting the engine at low cranking speed. A magneto in good condition is the average and gives practically the same results as the one in excellent condition. Medium will give trouble starting in cold weather while poor is very apt to prevent starting entirely.

2—Weak magnets, short magneto coils, loose connection at the magneto contact plug or coil box terminal, oil-soaked commutator wires, poor contact between the commutator and roller, either being worn, pitted contact points or dirty spark plugs. Trouble has been encountered because of too strong a spring being installed on the carbureter chocker, thereby preventing the suction of a sufficiently rich mixture to start the engine.

Leave Rotor as It Is

Q—Regarding the Remy distributer, the rotor does not quite touch the points of contact leading to the spark plug wires. Would it be better if a slight spring contact were but on the rotor so as to make the contact positive, same as Delco?—W. J. Roberts, Ishpenning, Mich.

It is not intended that the rotor should have a contact with the points referred to. There should be a small gap between the two which serves to intensify the spark before reaching the spark plug.

Generator Fuse Blows

Q—The generator fuse blows almost as soon as it is replaced on my 1918 Dodge Brothers car. When the battery is charged from an outside source the starter works perfectly and lights are good. An ammeter was tried on the two clips which hold the fuse on generator and needle touched the pin on the charge side. If the trouble is in the wiring, how should I find it?—Julian L. Nugent, Dayton, Wyo.

The diagnosis is evidently correct; that is, that there is a short-circuit in some of the wiring units. The fact that with the second generator the trouble was present proves the first generator not guilty. By connecting an ammeter and battery in the various circuits you will be able to determine readily which one is causing the trouble. It may be well to go over all wiring and all connections minutely to see if you cannot locate some spot where the wiring insulation has been cut or bruised so as to expose the wire and perhaps permit it to touch the frame of the car, thus causing a short. Look at the spot where the wires enter the conduits, for occasionally they will chafe at this point and the metallic covering naturally carry the current to the ground.

Increasing Charging Rate Maxwell

Q—Publish instructions for raising the charging rate of the Simms-Huff generator in the 1918 Maxwell 25. It is a unit motor-generator.—A. R. Morse, Wagner, S. D.

Under the dashboard will be found the control unit. This has a resistance inserted in series with the shunt field of the generator and is the means of controlling the voltage output of the generator. Cutting several turns of this resistance will allow the generator to charge at a higher rate. The brushes on the generator can be moved slightly by loosening the ring bus which holds them and shifting the brushes. When the meter or the indicator cuts in at a slightly slower engine speed then the output is being increased.

Wiring of 1915 Hupmobile

Q—Publish wiring diagram of model K Hupmobile and show how I can connect an ammeter on this model.—F. O. Crosby, Toledo, Ohio.

It is not practicable to make this installation.

Rectifying Ford Current

Q—Could the following arrangement be applied to a Ford: Run the ignition from a high-tension magneto, and rectify the generator current to charge a storage battery?

2—If this cannot be done, where can I get a small generator to work off the fan belt pulley?—J. I. Kinder, Sharpsburg, Pa.

1—The high-tension magneto part of the equipment is all right, but the other is doubtful. Referring to the voltage curve of the Ford magneto, Fig. 8, the voltage at an engine speed of 950 is 22. This corresponds to a car speed of 20 m.p.h. at

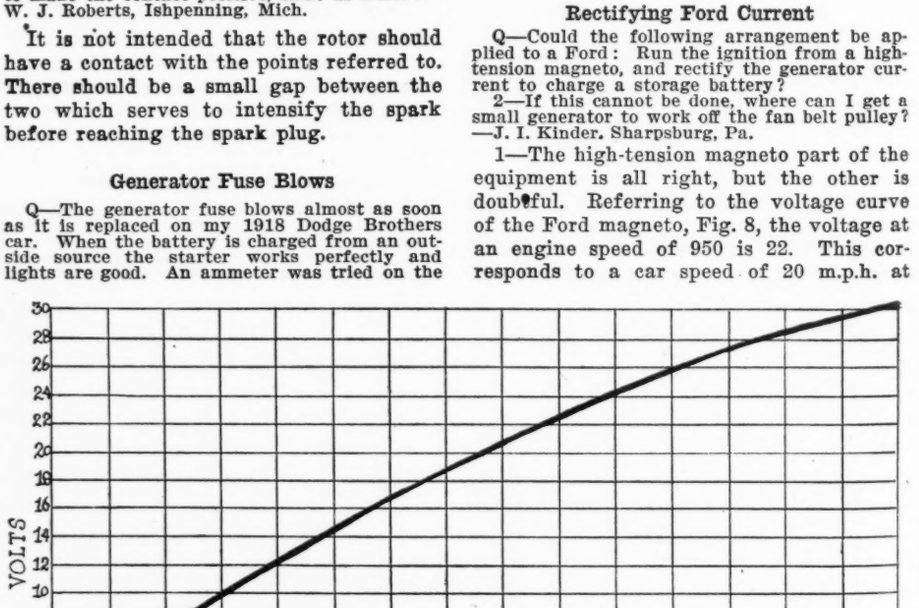


Fig. 8—Voltage curve of the Ford magneto showing voltage at 950 r.p.m.

which most average driving is done. The efficiency of the ordinary rectifier is very low, less than 50 per cent in many cases. The Ford car needs a 12-volt battery, so where are you going to get the voltage to charge the battery? A vibrating rectifier will not do because it must have a constant-cycle current, which the Ford magneto does not develop, because of the varying speed. A mercury are rectifier will not do because the vibration of the car will not permit it to operate. It is hardly feasible to install a rotary converter, because the converter would have to be synchronized with the magneto every time the engine was started and then would have to run at fairly constant speed. A motor-generator seems about the most plausible of all, and still it would hardly serve because of the small current consumption, low voltage and low efficiency of the outfit.

2—Any of the big electrical equipment manufacturers for motor cars can supply this.

Dissembling a Battery

Q—Explain the process of dissembling and removing the sediment in a storage battery. How are the connections between the cells removed? Is it necessary to keep the electrolyte of each cell separate after it has been taken out?—H. O. Denhart, Ransom, Ill.

1—It is advised that battery repairs be made by those with experience and equipment to enable them to work satisfactorily. The process of dissembling the battery is given step by step. One of the most important things to remember is to keep foreign material away from the electrolyte and the plates.

Punch a hole in the exact center of the terminal head. Drill a hole fully ¼ in. deep into the post, using a ¾-in. machine drill. The connectors then should be lifted off with a pair of pliers. If they do not come off easily apply a small lead burning flame to soften the lead at the joint of the post and the connector.

Now clean off very carefully the lead borings and foreign matter. Remove the vent plugs and turn the battery upside down on a wash tank and allow the electrolyte to drain into it. No regard need be paid to separately catching and containing the electrolyte.

Place the battery on an upside down position in a tank containing boiling water, to a depth of 2 in. on the wood casing of the battery. Five minutes in this boiling water will be enough to soften the compound. After the compound is softened, place the battery on its side, and with a pair of pliers pull out alternately on the posts until they come out.

Removing the element will leave a deposit of compound around the edge of the jar and the terminals. This should be removed with a putty knife and a screwdriver. This must be done carefully or the element will not fit back on.

After all the cells have been treated in this manner, the sediment can be washed out of the jars with a hose, having sufficient force to loosen the material collected on the bottom. When all has been removed be sure to rinse out the jar with distilled water.

In re-assembling the battery all the material used must be on hand, and the parts to be sealed should be dry or the compound will not stick to the jars or the post and a leaky battery will result.

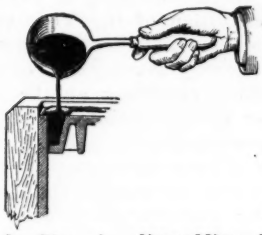


Fig. 9—Step in dissembling battery, pouring sealing compound

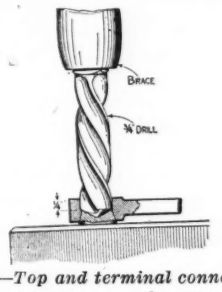


Fig. 10—Top and terminal connections of the battery must be removed

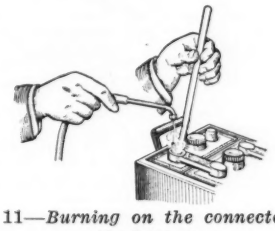


Fig. 11—Burning on the connecters for the battery

Dry the wells of the cells with a gas flame or a lead burning flame. Temporarily fit in the covers to be sure that they will fit when it is necessary to put them in hurriedly.

Warm the wells of the post and pour sealing compound until the well is nearly full. Then press the covers on quickly. With a dipper fill the space between the jar and the cover about half full of the sealing compound. Allow this to cool before filling completely. Then fill up slightly more than full, and after it is cooled off trim off to a level top with a knife.

The connector is now ready to be burned back into place. Place a post builder over the terminal. A post builder is a mold which allows the post to be built and formed to the correct size. After the posts are built up the connectors are laid in place over the built up posts and the connectors are burned with a lead burning flame. The battery is now ready to be filled with electrolyte.

Eveready System on Ford

Q—I have a Ford car equipped with an Eveready starter. It has a direct drive motor-generator bolted on the front of the car just below the radiator. It does not keep the battery charged, and when the battery is out and the engine running no spark occurs when the two battery leads are snapped together. I think the trouble is in the brushes, because when the two small brushes are pushed down harder against the commutator a spark is produced at the battery terminals. I have put in new brushes. Are the two small brushes for the generator and the two larger ones for the motor? What kind of current regulation has this machine?

2—How can I connect an ammeter to this system

3—Does it hurt to run with the battery disconnected?—N. L. Medberry, Brown Valley, Minn.

1—The system is designed to keep the battery charged and will do so if it is in proper adjustment. Clean off the commutator with a fine grade of sandpaper. Make sure that the mica between the commutator segments does not project above the profile of the copper segments. Apply a very light coating of vaseline to the commutator surface, clean the brushes and be sure that they make contact in the holders. If the brushes are not held down to the surface of the commutator, stretch the springs slightly, which will increase the compression on the brush.

2—This system is readily fitted with an ammeter.

3—No harm, except that the lights will not light.

New Magnets On Ford

Q—Would it be advisable to install new magnets on a Ford car without new coils or would there be danger of burning the old coils out?—J. C. Freed, Teegarden, Ind.

It will not be necessary to install new magnets unless you desire to replace the smaller ones with the larger size now used. If your magnets need recharging, that is a simple matter and you are referred to MOTOR AGE of Sept. 12, 1918, for complete instructions; also to the issue of Oct. 10, 1918, for more details. No, new magnets will not burn out the coils, but you would get better results with the larger coils, as it would increase the electrical output materially. If you use gas headlights, the smaller magnets and spools or coils will take care of the ignition.

1914 Velie Wiring

Q—Show wiring diagram of the starting and lighting system of the 1914 Velie. Were there any changes made in this wiring system in the 1913 and 1915 models?—Charles A. Barker, El Paso, Tex.

This diagram is shown in Fig. 7.

The same Gray & Davis system was used in 1915, but extensive additions were made to the system.

Engines

Pounding on Hard Pulls

Q—When my Buick 25 attains a speed of about 25 m.p.h. it knocks and pounds, but when it pulls uphill the knock disappears. Is this caused by worn wristpins or the main bearings?

2—When starting in cold weather the engine misses on one cylinder, but after driving about 1 mile it fires on all four. It has a Schebler model O carbureter. When the engine is idle it runs unevenly.—C. J. Almquist, Del Valle, Tex.

1—A pound or knock on a hard pull, such as would come in climbing a hill, would indicate loose bearings, loose rods or loose wristpins, whereas these defects should not show so plainly on a level road. It is probable the bolts that hold the engine to the frame are loose. If so, this would permit the engine to jump around and up and down sufficiently to cause the pound mentioned while on a level road, whereas on a pull the strain would hold it in place and besides, the engine speed being reduced, would not be such as to cause the engine to leave its supports to any great extent. Go over every bolt and nut you can find on the engine and transmission and set them tight and it is probable the trouble will be eliminated.

2—Most engines miss for a while in very cold weather, particularly if the mixture is at all thin. If this happens in one particular cylinder, it is likely to be caused by the valve stem sticking through being gummed with oil or because of a weak spring. After the engine has warmed up a little the gum will soften and permit the

stem to work. Then, also, after the warmth has come the parts may have expanded and thus prevent admission of air around the valve stem. If one stem is worn badly, it will admit too much air and thus rarify the mixture until heat has expanded the parts. Any unevenness of running when the engine is idling may come from either too rich or too lean a mixture and ordinarily calls for carbureter adjustment. But you cannot obtain this correctly unless you have tight valves and stems, sufficient spring pressure against the valves, correct ignition and right timing of both valves and spark.

All these should be checked up to know they are correct before a good adjustment of the carbureter can be expected. Of course a little good can be obtained by adjusting the carbureter to overcome, in a measure, the other ills.

Rebuilding Ford Engine

Q—I am rebuilding a Ford. I will change the valves, make the ports larger and make a manifold with larger openings, both intake and exhaust in one casting. I will put the carbureter up close to the manifold. Will a large carbureter be any better in this case where the valves and manifold are larger? I intend to lower the seat and put in a deeper cushion by removing the tank from under the seat. I also am going to make lighter pistons to help get more speed with less vibration.—George L. Vette, Lafayette, Col.

Yes, a larger carbureter probably will help under these conditions. Be careful not to lighten the pistons too much. If you are going in for speed, consult some makers of alloy pistons. The best plan is to send them your block and have the pistons fitted at the factory.

Engine Lacks Power

Q—I have a 1916 E25 Crow-Elkhart car, gear reduction 4¼ to 1 on high, which has not the power it should have. Will putting in new ring gear of 4¾ to 1 and aluminum pistons give the desired results?

2—Do you think the cylinders should be reground when fitting the new pistons? The cylinders are not badly worn but one cylinder will not hold compression like the others.

3—The car otherwise is in good shape. Do you think it would justify me in spending $75 in making this change?

4—Will aluminum pistons stand up under hard service?—Fred P. Steinmetz, Chandler, Ind.

1—The gear reduction to which you refer, along with the aluminum pistons, undoubtedly would offer some relief, but are you certain your trouble lies in the gear ratio and the pistons? It would be advisable to check the valves for adjustment and for leakage. Check the timing of your ignition and the condition of it. Your trouble is very often the cause of valves not seating properly, thereby causing loss of compression; ignition occurring at the improper interval or contact points burned, pitted or improperly adjusted. There is also a possibility of your carbureter not being adjusted properly for general conditions.

2—If the cylinders have seen a great deal of service and show considerable wear, it would be advisable to regrind them and fit new pistons.

3—Until you had checked the entire mechanism as suggested, it hardly would be advisable to spend $75 on the job and if the job is figured more closely, considering labor must be paid for, the cost would be a great deal more.

4—Yes, but if you decide to fit aluminum pistons, better take up the matter with a reliable concern specializing in this work. An ordinary shop mechanic cannot do a good job of fitting aluminum pistons.

Engine Knocks and Overheats

Q—My five-passenger four-cylinder 1917 Olympian car, which has been run only 4000 miles, has a very bad knock in the engine. Cylinder No. 4 is worn and has ⅛-in. side play, but the others are in good condition. What causes this, a loose connecting rod?

2—Is it possible to fit rings on only one piston without injuring the engine?

3—The engine gets very hot when the car is run at 25 m. p. h. for about 1 hr. It fires perfectly but has no speed or pulling power. Give remedy.—H. P. Murphy, Chicago.

1—Number four cylinder has probably been starved of lubricating oil through failure of the system to operate. The knock is caused from side slap of the piston; ⅛ in. is excessive.

2—Yes.

3—Overheating may be due to clogged radiator, spark retarded too far, poor oil or too little oil. Be sure your mixture is as lean as possible. Worn pistons or cylinders may let some of the exploded gases past the rings, thus burning the oil away. This produces friction and heat.

Several Engine Queries

Q—Has an engine with the camshaft in the head any advantages over other types? I am referring to valve-in-head engines.

2—Are the sixteen-valve-head attachments for Fords to be relied upon?

3—Can they be installed by anyone without machine work?

4—Suggest some manner of attaching a magneto and generator on a Ford. I wish to drive same with sprockets and silent chain, using the end of the camshaft to drive.

5—Where can I get sprockets that can be used with a silent chain for this equipment?—H. C. Buttrick, Muskegon, Mich.

1—Yes. Closer adjustment, more positive and quicker action, less noise.

2—Yes.

3—Yes.

4—See Electrical Equipment series in issues of last fall for the methods of installing the different makes. This will be republished in book form later.

5—Refer to the advertising pages of MOTOR AGE.

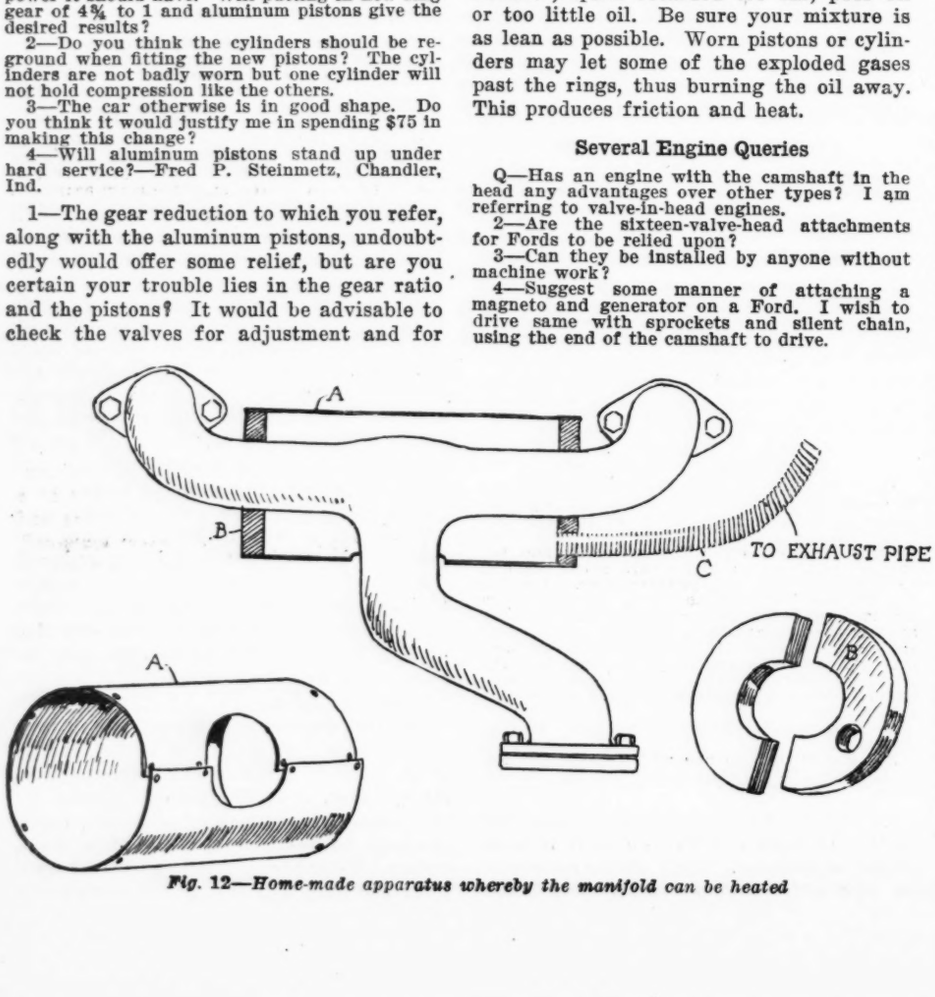


Fig. 12—Home-made apparatus whereby the manifold can be heated

Lubrication

Oiling of Chandler

Q—Give diagram of the flow of oil in the 1918 Chandler.—C. F. Meier, Bouton, Iowa.

No diagram showing the flow of oil is available. The oil is drawn from the sump by the plunger pump and forced through tubes to the pockets over the main bearings as well as another lead on the chains in front of the crankcase. The surplus oil from these pockets flows over and is caught in a splash pan, where it is struck by the connecting rods as they revolve, which lubricates the crankpin bearings. The spray from this splash pan lubricates the camshaft. The surplus oil from this tray is drained back to the sump, where, of course, it is taken through the strainer, and the process is repeated.

Oil Indicator Breaks

Q—The spindle on my Overland 75 on the turbine and in the oil circulation indicator on the dash broke and soon after the glass cover to same. I had the wheel removed and a new glass put in, but it broke in a few hours. Since then four more new glasses, some very heavy, have been put in but none lasts over a few hours, and some not an hour. The turbine has not been replaced. I fitted a piece of rubber and fabric in place of the glass, this stretches some, and with the oil level at full height much more than when it is lower. I have tried the regular cork and other gaskets under and above the glass. What is the cause and the remedy?—Angus Ross, Wessington, S. D.

Two remedies may be prescribed for this difficulty. To overcome the oil pressure difficulty a by-pass will be necessary. This will relieve the excessive pressure. It may be procured from Overland. This has a needle regulation to take care of the pressure and the part is installed easily. It may be the by-pass cannot be procured in your town. If this is so and you do not wish to send to the factory at Toledo, then another scheme may be used. Remove the pipe which is connected onto the upper half of the crankcase and plug the end with solder, run in. Then drill a hole through the solder, about $\frac{1}{16}$ in. This will reduce the size of the pipe to all purposes and will prevent the excessive pressure. If this $\frac{1}{16}$-in. hole seems too small, a slightly larger hole can be made after a little experimenting.

Engine Stalls Until Pushed

Q—The starter refused to crank the engine on my Paige G 2-6-46. I got out and tried the hand crank but the engine would not turn over. I then put the engine in high gear, got behind and pushed 3 or 4 ft. The engine then cranked as easily as usual. This happened two times in 30 min. Can you suggest something? Could there be a broken ball bearing in the transmission? When the engine runs free on level it has a very decided rattle. This rattle cannot be heard if the spark is retarded until a speed of 20 m.p.h. is reached. There is no noise of any kind on a hill or even a slight pull or on holding back in gear coming down hill.—Walter J. Owens, Washington.

This appears to be an extraordinary case, and the information you gave us is very

meager. Did you try the starter after pushing in the clutch pedal? If not, do this, and then if the engine will not start, the trouble is in the engine. With the engine eliminated, the trouble must be in the transmission somewhere. A starting motor is not an infinitely powerful appliance. Do you have in your transmission a very heavy grease? If so, the trouble is right here. The torque required to break the gears away from this congealed grease in cold weather is immense. The starting motor cannot handle it. It seems the engine of your car is in good condition, except for the rattle. This can be remedied by an overhauling and general adjusting.

Sundry Hupmobile Queries

Q—What model Hupmobile was manufactured in 1910-1911?
2—Can I get repairs for this car through Hupmobile?
3—Describe the oiling system used on this car.
4—Describe the transmission.—J. T. Lowe, Plankinton, S. D.

1—The earliest model of the Hupp was known as the 16-20, so named because of the fact that the engine was rated at 16 to 20 hp. This four-cylinder car listed at $750. A little later a 20 was brought out, listing at $900. That was in 1912, but in 1913 the C and E were produced. The latter had an engine 3¼ by 5½ and was almost the counterpart of the Hupp 32 of 1914, except that the latter had a starter.

2—Yes, by writing to the nearest Hupmobile agent or to the Hupp Motor Car Corp., Detroit.

3—The oiling system was similar to that on the later models but not during 1918 and 1919. It consisted of a funnel above the flywheel and the flywheel threw the oil into this, whence it found its way to the crankshaft and then into the crankcase.

4—This was an ordinary sliding gear transmission, but because of the light weight of the car it had but two speeds forward.

Carburetion

Manifold for Chandler

Q—I have been figuring on buying a Wilmo manifold for my 1918 Chandler, which has a very long manifold. I know the Wilmo is just the thing for winter, but how about summer? Will it get too hot?
2—Is there another concern that makes a heater for this car?
3—Do you know of a home-made device to put on this car?
4—What speed should this car make when everything is in good working order?
5—How can the differential of a Ford be cleaned?—C. F. Meier, Bouton, Iowa.

1—Under normal conditions, no.

2—See the advertising columns of MOTOR AGE.

3—A suggestion for a device whereby the manifold can be heated is shown in Fig. 12. A sheet metal cylinder, A, is made to fit the intake manifold and held in place to the wooden end pieces B by round-headed screws. The pieces B should be made a snug fit so that they will fit tightly upon the manifold. A hole is made in one of the end pieces into which is fitted a length of flexible tubing to connect to the exhaust pipe to convey heat from the latter. In making the cylinder A it is a good plan to first make a paper pattern and fit it around the manifold to make sure that the metal will be cut properly. To assemble the device, place the wood end pieces on the manifold and wrap the metal cylinder A around them, holding the apparatus in place by winding several turns of wire around it. Holes can now be drilled for screws in the metal and the whole device permanently fastened in place by the screws. Should any large gaps occur where the wood pieces fit around the manifold, they can be stuffed up by using asbestos yarn or some other form of packing. There are many ways in which the flexible tubing can be connected to the exhaust pipe, and one of the best ways is to make a metal stove to clamp around the exhaust pipe and fasten the tubing directly to it, having first cut a hole for the latter in the stove.

4—About 65 m.p.h.

5—Use kerosene, forced in with a grease gun at high velocity.

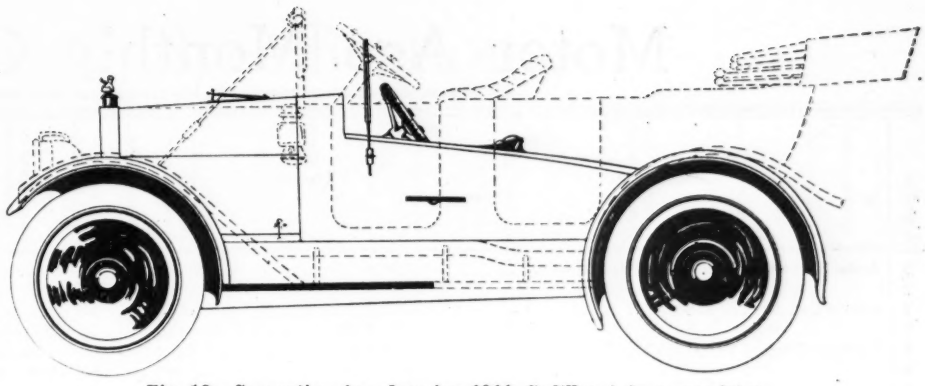


Fig. 13—Suggestion for changing 1911 Cadillac into a speedster

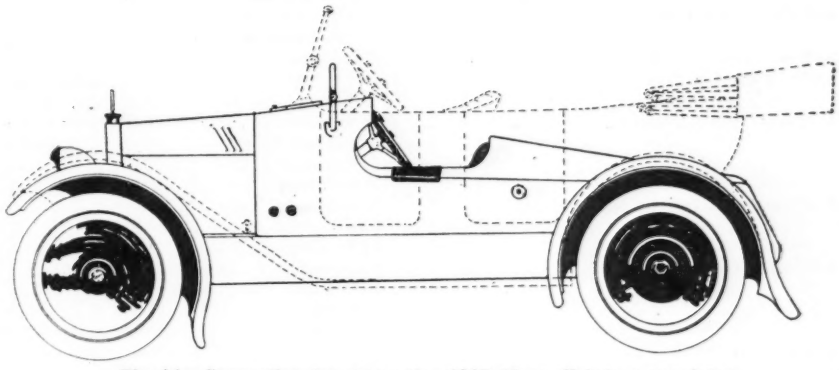


Fig. 14—Suggestion for converting 1915 Maxwell into a speedster

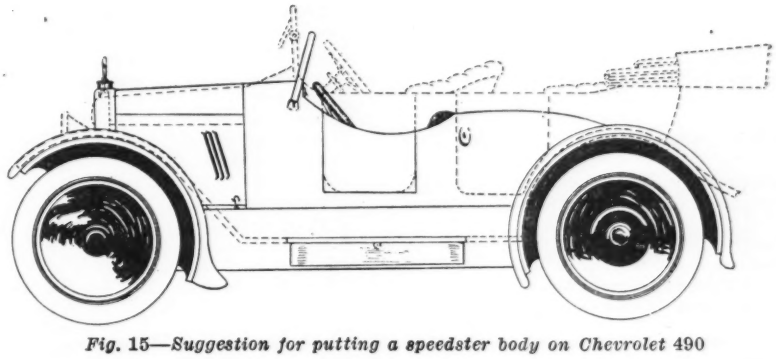


Fig. 15—Suggestion for putting a speedster body on Chevrolet 490

Rebuilding

Designing a Packard

Q—Publish diagram of a Packard speedster as was illustrated in a recent issue of MOTOR AGE and give some specifications for same.—R. L. McClure, Danville, Ill.

One of the designs by A. W. Glasier of Madison, Wis., had for its foundation the Packard chassis. Communication with Mr. Glasier might bring forth the specifications he intended for the design. The other Packard design illustrated was by Paul Schlachter, Norwalk, Ohio. In this design the Packard lines were adhered to closely. The Packard hood was used, as were the lamps. The runningboards were removed and an under pan installed that inclosed the whole under side of the car from the front to the rear axle. Steps were installed to take the place of the runningboards. Individual crown fenders and steel disk wheels helped to make the car. We do not supply the detailed specifications.

Chevrolet 490 Speedster

Q—Give suggestion for speedster body on a 490 Chevrolet.
2—Tell me of some concern which has blueprints or plans for sale.—Robert F. Redinger, Gardner, Kan.

1—This is shown in Fig. 15.

2—MOTOR AGE knows of no concern selling plans of speedster bodies.

1915 Maxwell as Speedster

Q—Publish suggestion for converting a 1915 model Maxwell into a speedster. This car has a 1916 Overland radiator and has a much larger steering wheel.—Fred S. Travis, Defiance, Ohio.

This is shown in Fig. 14.

Speedster Constructed from Cadillac

Q—Publish suggestion to rebuild 1911 Cadillac 30.—L. P. Forby, Fort Smith, Ark.

This is shown in Fig. 13.

Motor Age Monthly Guide to Tractors

These tables are revised and brought up to date monthly

Line No.	Manufacturer	Tractor	Drawbar horsepower	Belt horsepower	No. plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	Cylinders
1	Acme Harvesting Machine Co., Peoria, Ill.	Acme	12	25	3	.....	2600	6000	$1,800	2 Wh.	54	Beav.	4 Ver.
2		Acme	12	25	3	.....	2600	6800	2,250	2 Cr.	.....	Beav.	4 Ver.
3	Adams Co., Maryville, Ohio	Adams	9	13	1-2	.....	.....	5500	850	2 Wh.	36	Herc.	1 Hor.
4	Advance-Rumely Thresher Co., Laporte, Ind.	Oil Pull	12	20	3	22 x 36	2150	.....	.....	2 Wh.	51	Own	2 Hor.
5		Oil Pull	16	30	4	28 x 44	2850	.....	.....	2 Wh.	56	Own	2 Hor.
6		Oil Pull	20	40	5-6	32 x 52	3750	.....	.....	2 Wh.	64	Own	2 Hor.
7		Oil Pull	30	60	8-10	36 x 60	5900	.....	.....	2 Wh.	80	Own	2 Hor.
8	Allis-Chalmers Mfg. Co., Milwaukee, Wis.	Allis-Chalmers	18	30	3-4	.....	3000	5300	.....	2 Wh.	50	Own	4 Ver.
9		Allis-Chalmers	10	18	2-3	.....	1650	4800	.....	2 Wh.	56	Own	2 Opp.
10		Allis-Chalmers	6	12	1	.....	1000	1850	.....	2 Wh.	48	Le Roi	4 Ver.
11	Andrews Tractor Co., Minneapolis, Minn.	Andrews	12	20	.....	.....	1900	5250	1,000	2 Wh.	48	Veer.	4 Opp.
12	Appleton Mfg. Co., Batavia, Ill.	Appleton	12	20	.....	24	2200	4900	1,800	2 Wh.	54	Buda	4 Ver.
13		Aultman-Taylor	15	30	3-4	22 x 36	3300	7800	.....	2 Wh.	70	Wauk.	4 Ver.
14	Aultman-Taylor Machinery Co., Mansfield, Ohio.	Aultman-Taylor	22	45	4-6	32 x 50	4700	12800	.....	2 Wh.	70	Own	4 Opp.
15		Aultman-Taylor	30	60	8-12	42 x 64	8000	23000	.....	2 Wh.	90	Own	4 Opp.
16		Multipedal	5	10	.....	.....	750	950	.....	2W or 2C	.....	Le Roi	4 Ver.
17		Multipedal	12	20	.....	.....	2000	3500	.....	2 Cr.	.....	Buff.	4 Ver.
18	F. C. Austin Co., Inc., Chicago,	Multipedal	15	30	.....	.....	2400	4500	.....	2W or 2C	.....	Buff.	4 Ver.
19		Multipedal	20	40	4	.....	3200	10250	.....	2 Cr.	.....	Auto.	4 Ver.
20		Multipedal	25	50	.....	.....	4200	12500	.....	2 Cr.	.....	Buff.	4 Ver.
21	Automotive Corp., Fort Wayne, Ind.	Automotive	12	24	2	30	1500	3200	1,450	.....	42	Herc.	4 Ver
22		Avery	5	10	2	Small	.....	2600	.....	2 Wh.	30	Own	4 Ver.
23		Avery	5	10	.....	.....	.....	3050	.....	2 Wh.	42	Own	4 Ver.
24		Avery	8	16	2-3	20 x 30	.....	4900	.....	2 Wh.	50	Own	2 Hor.
25	Avery Co., Peoria, Ill.	Avery	12	25	3-4	24 x 36	.....	7500	.....	2 Wh.	56	Own	2 Hor.
26		Avery	14	28	3-4	.....	.....	6800	.....	2 Wh.	60	Own	4 Hor.
27		Avery	18	36	4-5	28 x 46	.....	9250	.....	2 Wh.	65	Own	4 Hor.
28		Avery	25	50	5-6	32 x 54	.....	12500	.....	2 Wh.	69	Own	4 Hor.
29		Avery	40	80	8-10	36 x 60	.....	22000	.....	2 Wh.	87½	Own	4 Hor.
30	Bates Tractor Co., Lansing, Mich.	Bates All Steel	15	25	3	24	3000	4000	.....	W.&C.	50	Own	4 Ver.
31	Bean Spray Pump Co., San Jose, Cal.	Track Pull	6	10	2	.....	1125	3200	1,340	1 Cr.	.....	Le Roi	4 Ver.
32	Beltrail Tractor Co., St. Paul, Minn.	Beltrail	12	20	2-3	.....	2000	4500	.....	1 Cr.	.....	Wauk.	4 Ver.
33		Best Tracklayer	12	25	.....	22 x 36	2100	5200	2,450	2 Cr.	.....	Own	4 Ver.
34	C. L. Best Gas Tractor Co., San Leandro, Cal.	Best Tracklayer	20	40	.....	32 x 54	.....	11000	4,100	2 Cr.	.....	Own	4 Ver.
35		Best Tracklayer	38	75	.....	42 x 70	.....	28000	5,850	2 Cr.	.....	Own	4 Ver.
36	Bethlehem Motors Corp., Allentown, Pa.	Bethlehem	18	36	4	28 x 46	3100	6200	.....	2 Wh.	54	Beav.	4 Ver.
37	Blumberg Mfg. Co., San Antonio, Tex.	Blumberg	9	18	.....	.....	.....	2450	850	2 Wh.	40	Own	4 Ver.
38		Blumberg	12	24	.....	.....	.....	8400	1,250	2 Wh.	40	Own	4 Ver.
39	Boring Tractor Corp., Rockford, Ill.	Boring	....	20	.....	.....	.....	3550	1,485	2 Wh.	54	Wauk.	4 Ver.
40	Brillion Iron Works, Brillion, Wis.	Brillion	12	22	3	26	3000	4900	.....	2 Wh.	60	Field	4 Opp.
41	Buckeye Mfg. Co., Anderson, Ind.	Trundaar	20	35	4	.....	4000	9200	.....	2 Cr.	.....	Wauk.	4 Ver.
42	Buckeye Traction Ditcher Co., Findlay, Ohio.	Buckeye 40	16	30	.....	.....	.....	21000	5,500	2 Cr.	.....	Auto.	4 Ver.
43		Buckeye 60	24	45	.....	.....	.....	25000	6,500	2 Cr.	.....	Auto.	4 Ver.
44		Creeping Grip	15	25	.....	.....	3000	7000	2,000	2 Cr.	.....	Wauk.	4 Ver.
45	Bullock Tractor Co., Chicago,	Senior	35	50	.....	.....	6000	18000	4,500	2 Cr.	.....	Wauk.	4 Ver.
46		Giant	50	75	.....	.....	7500	20000	5,000	2 Cr.	.....	Wauk.	4 Ver.
47		Case	10	18	2-3	20 x 28	2080	3400	1,200	2 Wh.	42	Own	4 Ver.
48	J. I. Case T. M. Co., Racine, Wis.	Case	10	20	3	20 x 36	2330	5050	1,325	2 Wh.	52	Own	4 Ver.
49		Case	15	27	3-4	26 x 46	3000	5600	1,600	2 Wh.	52	Own	4 Ver.
50		Case	20	40	5-6	32 x 54	4400	14050	3,000	2 Wh.	66	Own	2 Opp.
51	Champion Tractor Co., Argo, Ill.	Champion	15	30	3	24	2750	3100	1,465	.....	48	Buda	4 Ver.
52	Chase Motor Truck Co., Syracuse, N. Y.	Chase	9	18	.....	.....	.....	4700	1,200	2 Wh.	48	Buda	4 Ver.
53	Cleveland Tractor Co., Cleveland, Ohio.	Cleveland	12	20	2	.....	1500	3200	1,585	2 Cr.	.....	Weid.	4 Ver.
54	C. O. D. Tractor Co., Minneapolis, Minn.	C. O. D.	13	25	3	.....	2500	6500	1,395	2 Wh.	70	Own	2 Hor.
55	Coleman Tractor Co., Kansas City, Mo.	Coleman	16	30	3	24	3000	5100	1,750	2 Wh.	44	Clim.	4 Ver.
56	Craig Tractor Co., Cleveland, Ohio.	Craig	15	25	3	28 x 46	3000	5000	.....	.....	44	Beav.	4 Ver.
57	Dart Truck & Tractor Corp., Waterloo, Iowa.	Blue J	15	20	3	24	3000	4500	1,750	2 Wh.	40	Buda	4 Ver.
58	Dauch Mfg. Co., Sandusky, Ohio.	Sandusky J	10	20	2-3	24	2000	4080	1,500	2 Wh.	48	Own	4 Ver.
59		Sandusky E	15	35	4	32	3000	8000	2,500	2 Wh.	56	Own	4 Ver.
60	Dayton-Dick Co., Quincy, Ill.	Leader B	12	18	2-3	24	2500	4800	1,000	2 Wh.	48	Own	2 Opp.
61		Leader C	18	36	4-6	32	4000	6600	2,250	2 Cr.	.....	Twin	4 Ver.
62		Capital 20	20	....	.....	.....	.....	12000	3,000	2 Wh.	53	Own	2 Opp.
63	C. H. A. Dissinger & Bro. Co., Wrightsville, Pa.	Capital 30	30	....	.....	.....	.....	14000	4,000	2 Wh.	60	Own	2 Opp.
64		Capital 45	45	....	.....	.....	.....	16000	4,400	2 Wh.	66	Own	2 Opp.
65	Eagle Mfg. Co. Appleton, Wis.	Eagle F	12	16	3	26	2400	5900	1,522	2 Wh.	48	Own	2 Hor.
66		Eagle	22	30	4	32	3700	7050	1,853	2 Wh.	52	Own	2 Hor.
67	Electric Wheel Co., Quincy, Ill.	Allwork	14	28	3	28	3000	5000	1,575	2 Wh.	48	Own	4 Ver.
68	Elgin Tractor Corp., Piqua, Ohio.	Elgin B	9	18	2	.....	1600	2900	1,075	2 Wh.	42	Buda	4 Ver.
69		Elgin NE	12	25	2-3	20	2000	3300	1,385	2 Wh.	42	Erd	4 Ver.
70		E-B 12-20 AA	12	20	3	24	2500	4355	.....	2 Wh.	54	Own	4 Ver.
71		E-B 9-16	9	16	2	18	1500	4260	.....	2 Wh.	54	Own	4 Ver.
72	Emerson-Brantingham Co., Rockford, Ill.	E-B 12-20	12	20	3	24	2000	6155	.....	2 Wh.	60	Own	4 Ver.
73		E-B 20-35	20	35	5	28	3300	10000	.....	2 Wh.	72	Own	4 Ver.
74		E-B 40-65	40	65	8-10	44	10000	23500	.....	2 Wh.	90	Own	4 Ver.
75	Evans Mfg. Co., Hudson, Ohio.	Evans K	20	35	4	32	3500	5500	1,985	2 Wh.	60	Buda	4 Ver.
76	Fageol Motors Co., Oakland, Cal.	Fageol	10	18	2	.....	1250	3000	1,295	2 Wh.	48	Over.	4 Ver.
77	Farm Horse Traction Works, Hartford, S. D.	Farm Horse	16	34	3	28	.....	4950	1,485	2 Wh.	48	Clim.	4 Ver.
78	A. B. Farquhar Co., Ltd., York, Pa.	Farquhar	15	25	3-4	27	2500	6000	.....	2 Wh.	54	Buda	4 Ver.
79		Farquhar	18	35	4-5	30	3600	16000	.....	2 Wh.	84	Own	4 Ver.

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; horizontal; Opp., opposed. **Fuel**—G, gasoline; K, kerosene; D, distillate. **Carbureter**—Ray., Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Holl., Holley. **Magneto**—A-K, Atwater Kent; Sum., Sumter; Eise., Eisemann; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; jaw clutch. **Final drive**—S. G., spur gear; G., gear; Ch., chain. **Drive**—Op., open; In., inclosed.

and Their Technical Specifications

These tables are revised and brought up to date monthly

Line No.	Bore and stroke	Normal R. P. M.	Fuel	Make and size of carbureter	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Gearset type	Belt pulley diameter	Belt pulley R. P. M.	Belt speed F. P. M.	Speeds forward	Speed range, M. P. H.	Recommended plowing speed	Final drive	Drive	Furrow wheel	Line No.
1	4½x 6	850	G-K	1½-King.	.....	K-W	Own	.....	Sl. G.	14	960	3300	2	2¼-3⅛	2½	S. G.	Op.	.....	1
2	4½x 6	850	G-K	1½-King.	.....	K-W	Own	.....	Sl. G.	14	990	3300	2	.....	2½	S. G.	Op.	.....	2
3	.....	375	G-K	.....	.....	Web.	Own	.....	Ch.	14-18	950	.....	1	.....	2¼	Ch.	Op.	.....	3
4	6 x 8	500	K-D	2 -Own	Donal.	Bosch	Own	.....	Sel. G.	19	560	2790	2	2.1-3.26	2.1	S. G.	Op.	No	4
5	7 x 8½	530	K-D	2⅜-Own	Donal.	Bosch	Own	Own	Sel. G.	23	530	3190	2	2.1-3	2.1	S. G.	Op.	No	5
6	8 x10	450	K-D	2¾-Own	Donal.	Bosch	Own	Own	Sel. G.	26	450	3060	2	2-3.2	2	S. G.	Op.	No	6
7	10 x12	375	K-D	3¼-Own	.....	Bosch	Own	.....	.....	36	375	3540	1	1.9	1.9	S. G.	Op.	No	7
8	4¾x 6½	830	G-K	.....	Ben.	.....	Own	Own	Sel.	15	.....	2600	2	2.3-2.8	2.3	S. G.	In.	Yes	8
9	5¼x 7	720	G-K	1½-King.	Ben.	K-W	Own	Own	Sel. G.	14½	720	2600	1	2.3	2.3	S. G.	Op.	Yes	9
10	3½x 4½	1000	G	.....	Ben.	.....	B. & B.	Own	.....	10	1000	2600	.....	1½-2.8	2.3	S. G.	Op.	Yes	10
11	4 x 5	1000	G	1¼-Krice	.....	Bosch	Own	.....	Fr.	12	800	2500	3	.....	2¼	Ch.	Op.	Yes	11
12	4¼x 5¾	900	G-K	1¼-Scheb.	Ben.	Bosch	B. & B.	Nutt.	Sl. G.	12	825	2600	2	2-3½	2 ½	G.	Op.	Yes	12
13	4¼x 6¾	900	G-K	1⅜-King.	Ben.	Eise.	Own	Own	S. G.	20	450	2250	1	2.25	2¼	S. G.	Op.	Yes	13
14	5½x 8	600	G-K	2 -King.	.....	Eise.	Own	Own	S. G.	20	600	3100	2	2.13-2.93	2.93	S. G.	Op.	No	14
15	7 x 9	500	G-K	2½-King.	.....	Eise.	Own	Own	S. G.	24	500	3100	1	2.2	2.2	S. G.	Op.	No	15
16	2⅞x 4⅛	1000	G-K	.....	Orem	K-W	Own	.....	.....	6	1440	2600	1	2½	.....	.....	.....	Yes	16
17	4 x 5	1000	G-K	.....	Orem	K-W	Own	.....	.....	8	1300	2600	2	2 ½-3 ½	.....	.....	.....	No	17
18	4¼x 6	900	G-K	.....	Orem	K-W	Own	.....	.....	9½	965	2600	2	1½-3½	.....	.....	.....	No	18
19	5 x 7	800	G-K	1½-Ben.	Orem	K-W	Own	Own	Sel. G.	20	500	2600	2	1⅞-3	2	G.	Op.	No	19
20	6 x 7½	750	G-K	.....	Orem	K-W	Own	.....	.....	20	500	2600	2	1⅞-3	.....	.....	.....	No	20
21	3¾x 5⅛	1000	G-K	1¼-King.	.....	Eise.	B. & B.	Own	Sel. G.	10	1000	.....	2	2⅝-5¼	2⅝	G.	In.	Yes	21
22	3 x 4	1200	G-K	¾-King.	None	K-W	Own	Own	Sl. G.	5¼	1000	2360	4	1½-4½	1½	S. G.	Op.	No	22
23	3 x 4	1200	G-K	¾-King	None	K-W	Own	Own	Sl. G.	9	1000	.....	2	1-3	.....	.....	.....	.....	23
24	5½x 6	600	G-K-D	1¼-King.	None	K-W	Own	Own	Sl. G.	18	600	2830	2	1¾-3	1¾	S. G.	Op.	No	24
25	6½x 7	570	G-K-D	1½-King.	None	K-W	Own	Own	Sl. G.	19½	570	2880	2	1¾-2¾	1¾	S. G.	Op.	No	25
26	4⅝x 7	650	G-K-D	1¼-King	None	K-W	Own	Own	Sl. G.	16	700	.....	2	1¾-2¾	1¾	S. G.	Op.	No	26
27	5½x 6	650	G-K-D	1½-King.	None	K-W	Own	Own	Sl. G.	18	650	3000	2	2-3	2	S. G.	Op.	No	27
28	6½x 7	500	G-K-D	2 -King.	None	K-W	Own	Own	Sl. G.	22	500	2880	2	2-3	2	S. G.	Op.	No	28
29	7¾x 8	500	G-K-D	2 -King.	None	K-W	Own	Own	Sl. G.	26	500	3400	2	1¾-2 ⅜	2	S. G.	Op.	No	29
30	4⅝x 5½	800	K	1½-Own	Own	Dixie	Own	Own	Sl. G.	10	800	.....	3	1¼-6	2½	S. G.	.....	No	30
31	3½x 4½	1200	D	1 -Mayer	Donal.	Bosch	Own	Own	S. G.	12	600	1900	2	1½-2 ½	1	G.	In.	.....	31
32	3¾x 5¼	1000	G-D	1 -King.	Ben.	Dixie	Own	.....	Sl. G.	10	1000	2500	2	2½-3½	2½	S. G.	Op.	Yes	32
33	4⅝x 5¼	700	G-D	1½-Ens.	Ben.	Dixie	Own	Own	Sl. G.	10	700	1750	2	2-3	3	G.	In.	No	33
34	6¼x 6¼	600	D	1½-Ens.	Ben.	Dixie	Own	Own	Sl. G.	.....	.....	.....	3	.....	2½	G.	In.	.....	34
35	7¾x 9	435	D	2 -Ens.	Ben.	Dixie	Own	Own	Sl. G.	.....	.....	.....	3	.....	2⅜	G.	In.	.....	35
36	4¾x 6	900	K	Strom.	Ben.	Bosch	.....	.....	Sl. G.	10	1278	.....	2	1.8-3.3	.....	S. G.	In.	.....	36
37	3¾x 3¾	750	G	.....	Holl.	Dixie	.....	Foote	Sl. G.	10	600	1550	2	1-4	3	G.	In.	Yes	37
38	3⅜x 5	750	G	1¼-Strom.	Holl.	Dixie	.....	Foote	Sl. G.	16	600	2480	2	1-4	3	G.	In.	Yes	38
39	4¼x 5¼	1000	G-K	1¼-	Ben.	King.	.....	.....	Sl. G.	10	435	1140	2	1-5	.....	Ch.	Op.	Yes	39
40	3¾x 5	1000	K	1¼-King.	Own	Dixie	Bier.	Foote	Sl. G.	8	1000	2100	3	2-5	2	G.	Op.	No	40
41	4¾x 6¾	950	G-K-D	1½-Deppe	.....	Bosch	.....	Own	S. G.	10	950	2650	2	3.1-8	2½	S. G.	In.	.....	41
42	6½x 8	500	G-K	1½-Ben.	Ben.	K-W	Own	Own	G.	14	250	1000	4	3.1-8	.....	Ch.	Op.	.....	42
43	7½x 9	500	G-K	2 -Ben.	Ben.	K-W	Own	Own	G.	14	222	870	1	2½	.....	Ch.	Op.	.....	43
44	4¾x 6¾	900	G-K	1¼-Ben.	Ben.	Dixie	B. & B.	Own	Sl. G.	12	600	1875	3	1¾-3½	2¼	.....	.....	No	44
45	5½x 7½	850	G-K	.....	Ben.	Dixie	B. & B.	Own	Sl. G.	15	600	2250	3	1¾-3½	.....	.....	.....	No	45
46	7¼x 9 ½	.....	G-K	.....	Ben.	Dixie	B. & B.	Own	Sl. G.	14	60	220	2	2¼-3½	.....	.....	.....	No	46
47	3⅞x 5	1050	K	1½-King.	Own	King.	Own	Own	Sl. G.	14¼	1050	3900	2	2¼-3½	2¼	S. G.	In.	No	47
48	4¼x 6	900	K	1¼-King.	Own	King.	Own	Own	Sl. G.	17	900	4000	1	2¼	2¼	S. G.	Op.	No	48
49	4½x 6	900	K	King.	Own	King.	Own	Own	Sl. G.	16	900	3762	2	2-3½	2¼-3½	S. G.	Op.	No	49
50	8¾x 9	475	K	2½-King.	.....	K-W	Own	Own	Sl. G.	24	475	2980	2	2-3	2	S. G.	Op.	No	50
51	4¼x 5½	1000	G-K	1¼ Case	.....	Dixie	.. ..	Fuller	Sl. G.	12	850	2600	3	1½-4¼	2½	.....	.....	.....	51
52	3¾x 5½	900	G	1¼-Holl.	.....	King.	Bier.	Own	Sl. G.	8	900	1885	2	1½-2½	1½	G.	Op.	No	52
53	3¾x 5½	1200	G-K	1½-King.	Own	Eise	Own	B. & S.	S. G.	8	1200	2500	2	1¾-2½	3½	G.	In.	No	53
54	6½x 7	550	K	1½-King.	.....	K-W	Own	.....	S. G.	18	530	2500	3	.....	.....	S. G.	In.	Yes	54
55	5 x 6½	800	G-K	1¼-Strom.	Ben.	Dixie	B. & B.	.....	.....	12	800	2100	2	1¼-4	3	Worm	In.	Yes	55
56	4¾x 6	950	K	1½-Strom.	Ben.	Berl.	.....	Covert	S. G.	12	830	2610	2	24-3.86	2-4	S. G.	In.	Yes	56
57	4¼x 5½	1050	G	1¼ Zen.	Ben.	Dixie	Fuller	Own	Sl. G.	12	750	2355	3	1¼-6	2½	.....	In.	No	57
58	4¼x 5¼	985	G-K	1¼-King.	Ben.	Dixie	Own	Own	Sel. G.	10	975	2577	3	2-5	2-3	S. G.	Op.	Yes	58
59	5 x 6½	750	G-K	2 -King	Ben.	Dixie	Own	Own	Sel. G.	15	750	2945	2	2¼-3½	3-4½	S. G.	Op.	No	59
60	6¼x 6	750	K	1½-King.	Own	King.	Own	Own	Sel. G.	14	750	2750	2	1.8-3	1.8	G.	Op.	Yes	60
61	5 x 7½	700	K	1¾-King.	Ben.	K-W	Own	Own	Sel. G.	14	700	2600	3	.....	1.8	Ch.	Op.	No	61
62	8½x12	300	.....	.....	.....	.....	.....	.....	.....	36	300	.....	.....	.....	.....	.....	.....	.....	62
63	9 x14	300	.....	.....	.....	.....	.....	.....	.....	36	300	.....	.....	.....	.....	.....	.....	.....	63
64	10½x15	250	.....	.....	.....	.....	.....	.....	.....	40	250	.....	.....	.....	.....	.....	.....	.....	64
65	7 x 8	425	K	1½-Linga.	.....	Dixie	Own	Own	Sl. G.	20	450	2250	2	2-3	2	G.	In.	Yes	65
66	8 x 8	425	K	2 -Linga.	.....	Dixie	Own	Own	Sl. G.	24	450	2678	2	2-3	2	G.	In.	Yes	66
67	5 x 6	800	K	1½-King.	Ben.	King.	Own	Own	Sl. G.	12	800	2514	2	1¾-2.4	2.4	S. G.	In.	Yes	67
68	3¾x 5½	1000	G	.....	Own	King.	Own	.....	Fr.	9	1000	2360	7	.....	3	Ch.	In.	Yes	68
69	4 x 6	1000	G-K	-King	Ben.	Dixie	Own	.....	Fr.	9	1000	2600	6	1¼-3½	3	Ch.	In.	Yes	69
70	4¾x 5	900	K	.....	Ben.	K-W	Own	.....	Sl. G.	12	900	2800	2	1.81-2.33	.....	G.	In.	No	70
71	4½x 4½	800	K	1¼-Ben.	Ben.	K-W	Own	.....	Sl. G.	12	800	2500	2	1.72-2.33	.....	G.	In.	No	71
72	4¾x 5	850	K	1½-Ben.	Ben.	K-W	Own	.....	Sl. G.	14	708	2225	2	1.71-2.25	.....	G.	In.	Yes	72
73	5 x 7	700	K	1½-Ben.	Ben.	K-W	Own	.....	Sl. G.	16¾	600	2500	2	1.71-2.26	.....	G.	In.	No	73
74	7½x 9	500	K	2½-Ben.	Ben.	K-W	Own	.....	Sl. G.	22	500	2880	1	2	2	G.	In.	No	74
75	4½x 6	1000	G	1½-Ray.	Holl.	Dixie	B. & B.	Own	Sel. G.	24	415	2600	2	2¼-4½	2½	G.	In.	Yes	75
76	3¾x 5	1100	G-K	Till.	Own	Berl.	Own	Own	G.	6	.....	.....	1	2 ½-2¾	2 ½	G.	Op.	Yes	76
77	5 x 6½	800	D	1½-King.	Ben.	Dixie	Bier.	Own	Sl. G.	14	800	.....	2	1-4	3	Ch.	In.	No	77
78	4½x 6	900	G-K	1½-King.	Ben.	K-W	Own	Nutt.	Sel. G.	14	800	2000	2	1-4	.....	G.	In.	.....	78
79	6 x 8	550	G-K	2 -King	.....	K-W	Own	.....	.....	32	275	2300	2	1-2.3	.....	G.	Op.	.....	79

Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten., Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., vertical; Hor., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Cr..Carter; Perr., Perrin-Ingram. **Air Cleaner**—Donal., Donaldson; Ben., Bennett; pec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding

Motor Age Monthly Guide to Tractors and

Line No.	Manufacturer	Tractor	Drawbar horsepower	Belt horsepower	No. plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of Engine	Cylinders
80	A. B. Farquhar Co., Ltd., York, Pa.	Farquhar	25	50	6-7	33	5000	19000	.....	2 Wh.	84	Own	4 Ver.
81	Henry Ford & Son, Inc., Dearborn, Mich.	Fordson	12	20	2	.....	1800	2700	.....	2 Wh.	42	Own	4 Ver.
82	Four Drive Tractor Co., Big Rapids, Mich.	Fitch	20	35	4	28-32	3200	6000	$2,500	4 Wh.	42-36	Clim.	4 Ver.
83	Frick Co., Waynesboro, Pa.	Frick	12	25	3	27	3000	5800	.....	2 Wh.	60	Erd	4 Ver.
84	Fulton Tractor Co., Anderson, Ind.	Fulton	10	....	2	.....	.....	2500	1,275	2 Wh.	56	Wauk.	4 Ver.
85	Gile Engine & Tractor Co., Ludington, Mich.	Gile Q	18	....	4-5	36	3500	7000	.....	2 Wh.	60	Own	4 Ver.
86	Gray Tractor Co., Minneapolis, Minn.	Gray	18	36	4	30	3750	6200	2,250	Drum	54	Wauk.	4 Ver.
87	Hart-Parr Co., Charles City, Iowa.	New Hart-Parr	15	31	3	28	3000	5300	1,395	2 Wh.	52	Own	2 Hor.
88	Hession Tiller & Tractor Corp., Buffalo, N. Y.	Wheat	12	24	.....	.....	3000	4200	1,695	2 Wh.	48	Erd	4 Ver.
89	Hollis Tractor Co., Pittsburgh, Pa.	Hollis	15	25	3	.....	3000	2750	1,375	2 Wh.	30	Light	4 Ver.
90	Holt Mfg. Co., Peoria, Ill.	Caterpillar	25	45	.....	.....	5000	13600	.....	2 Cr.	.....	Own	4 Ver.
91		Caterpillar	40	75	.....	.....	9300	25000	.....	2 Cr.	.....	Own	4 Ver.
92	Huber Mfg. Co., Marion, Ohio.	Huber Light Four	12	25	3	22	2300	5000	1,285	2 Wh.	60	Wauk.	4 Ver.
93	Illinois Tractor Co., Bloomington, Ill.	C	18	36	4	32	.....	5000	2,150	2 Wh.	54	Clim.	4 Ver.
94	Imperial Machine Co., Minneapolis, Minn.	Imperial	40	70	.....	.....	7500	20800	4,500	2 Wh.	96	Own	4 Opp.
95	Indiana Silo Co., Anderson, Ind.	Indiana	5	10	.....	.....	1000	1700	900	2 Wh.	50	Le Roi	4 Ver.
96	International Harvester Co., Chicago,	Titan	10	20	3	24	1800	5700	1,225	2 Wh.	54	Own	2 Hor.
97		Mogul	10	20	3	24	1800	5500	1,125	2 Wh.	54	Own	1 Hor.
98		International	15	30	4	28	2350	9000	.....	2 Wh.	66	Own	4 Ver.
99	Joliet Oil Tractor Co., Joliet, Ill.	Bates Steel Mule	12	20	3	28	.....	4300	.....	2 Cr.	.....	Erd	4 Ver.
100	Kansas City Hay Press Co., Kansas City, Mo.	Prairie Dog	9	18	2	.....	1500	3000	1,250	1 Wh.	48	Wauk.	4 Ver.
101	Keck-Gonnerman Co., Mount Vernon, Ind.	Keck-Gonnerman	12	24	3	24	.....	6500	1,500	2 Wh.	61	Own	2 Hor.
102	Kinnard & Sons Mfg. Co., Minneapolis, Minn.	Flour City Jr.	14	24	3	.....	.....	6800	.....	2 Wh.	60	Own	4 Ver.
103		Flour City	20	35	4-6	.....	.....	10000	.....	2 Wh.	72	Own	4 Ver.
104		Flour City	30	50	6-8	.....	.....	14000	.....	2 Wh.	84	Own	4 Ver.
105		Flour City	40	70	8-10	.....	.....	21000	.....	2 Wh.	96	Own	4 Ver.
106	La Crosse Tractor Co., La Crosse, Wis.	Happy Farmer, F	12	24	3	24	2000	3800	1,150	2 Wh.	56	Own	2 Hor.
107		La Crosse G	12	24	3	24	2000	4000	1,250	2 Wh.	56	Own	2 Hor.
108	Lang Tractor Co., Minneapolis, Minn.	Lang	15	30	.....	.....	3000	4500	1,485	2 Wh.	60	Clim.	4 Ver.
109	Lauson, John, Mfg. Co., New Holstein, Wis.	Lauson	15	25	3-4	28	.....	6000	1,986	2 Wh.	54	Beav.	4 Ver.
110	Leader Tractor Mfg. Co., Des Moines, Iowa.	Rex	12	25	3	20-22	2400	5500	1,800	2 Wh.	60	Wauk.	4 Ver.
111	Leonard Tractor Co., Jackson, Mich.	Leonard	20	30	3	28	4000	5000	2,000	4 Wh.	50	Buda	4 Ver.
112	Lombard Auto Tractor Truck Corp., New York.	Lombard	.....	.....	.....	.....	1900	.....	.....	2 Cr.	.....	Own	6 Ver.
113	Liberty Tractor Co., Minneapolis, Minn.	Liberty	15	30	.....	.....	.....	5775	.....	4 Wh.	48	Clim	4 Ver.
114	Little Giant Co., Mankato, Minn.	Little Giant B	16	22	3-4	26	.....	5200	1,650	2 Wh.	54	Own	4 Opp.
115		Little Giant A	26	35	5-6	32	.....	8700	2,500	2 Wh.	66	Own	4 Opp.
116	Midwest Engine Co., Indianapolis, Ind.	Atlas	16	26	3	24	2800	5100	1,750	2 Wh.	66	Wauk.	4 Ver.
117	Minneapolis Steel & Machinery Co., Minneapolis, Minn.	Twin City 12	12	20	3	20	2000	4000	.....	2 Wh.	50	Own	4 Ver.
118		Twin City 16	16	30	4	24	3000	7800	.....	2 Wh.	54	Own	4 Ver.
119		Twin City 25	25	45	6	32	4700	16000	.....	2 Wh.	76	Own	4 Ver.
120		Twin City 40	40	65	8-10	36	7500	23700	.....	2 Wh.	84	Own	4 Ver.
121		Twin City 60	60	90	12-15	.....	11250	28000	.....	2 Wh.	84	Own	6 Ver.
122	Moline Plow Co., Moline, Ill.	Moline Universal D	9	18	2	.....	2000	3300	1,500	2 Wh.	52	Own	4 Ver.
123	Monarch Tractor Co., Watertown, Wis.	Lightfoot	6	10	1-2	.....	1100	3200	1,250	2 Cr.	.....	Kenn.	4 Ver.
124		Neverslip M	12	20	3	24	2200	6200	1,850	2 Cr.	.....	Erd	4 Opp.
125		Neverslip N	18	30	4	28	3300	7400	2,250	2 Cr.	.....	Doman	4 Ver.
126	National Tractor Co., Cedar Rapids, Iowa.	National E	9	16	2	22	1800	3800	1,075	2 Wh.	46	Wauk.	4 Ver.
127		National F	14	27	3	26	2250	4200	1,585	2 Wh.	46	Wauk.	4 Ver.
128	Nilson Tractor Co., Minneapolis, Minn.	Nilson Junior	16	25	3-4	24	3000	5000	1,775	2 Wh.	50	Wauk.	4 Ver.
129		Nilson Senior	24	36	4-5	30	4000	6400	2,475	2 Wh.	52	Wauk.	4 Ver.
130	Ohio Mfg. Co., Upper Sandusky, Ohio.	Whitney	9	18	2	20	1600	3000	1,175	2 Wh.	48	Gile	2 Opp.
131	Parrett Tractor Co., Chicago,	Parrett F	12	25	3	24	2600	5200	.....	2 Wh.	60	Buda	4 Ver.
132		Parrett H	12	25	3	24	2600	5350	.....	2 Wh.	60	Buda	4 Ver.
133	Peoria Tractor Corp., Peoria, Ill.	Peoria J	12	25	3	24	3000	5100	1,985	2 Wh.	56	Clim.	4 Ver.
134	Pioneer Tractor Co., Winona, Minn.	F	15	30	4	28	.....	8500	.....	2 Wh.	60	Own	4 Opp.
135		C	30	60	10	36	.....	23500	.....	2 Wh.	96	Own	4 Opp.
136	Port Huron Engine & Thresher Co., Port Huron, Mich.	Port Huron	12	25	3	22	2200	5700	1,600	2 Wh.	56	Erd	4 Ver.
137	Power Truck & Tractor Co.,	Power, E.	15	30	3	24-28	2600	4250	1,485	2 Wh.	60	Own	1 Hor.
138	Rock Island Plow Co., Rock Island, Ill.	Heider D	9	16	2	18	1500	4000	1,070	2 Wh.	54	Wauk.	4 Ver.
139		Heider C	12	20	3	24	2000	6000	1,395	2 Wh.	57	Wauk.	4 Ver.
140	Royer Ensilage Harvester Co., Wichita, Kan.	Royer	12	25	.....	.....	2200	4600	1,225	2 Wh.	54	Erd	4 Ver.
141	Russell & Co., The, Massillon, Ohio.	Junior	12	24	2	18	2000	6200	.....	2 Wh.	53	Wauk.	4 Ver.
142		Little Boss	15	30	3	24	3000	6900	.....	2 Wh.	53	Wauk.	4 Ver.
143		Big Boss	20	40	4	30	4000	7600	.....	2 Wh.	60	Model	4 Ver.
144		Giant	30	60	8	40	8000	24000	.....	2 Wh.	84	Own	4 Ver.
145	Scientific Farming Machinery Co., Minneapolis, Minn.	Princess Pat	10	18	.....	22	1500	1900	1,185	.....	40	Wauk.	4 Ver.
146	Short Turn Tractor Co., Bemidji, Minn.	Short Turn	30	....	3	.....	5000	.....	.....	2 Wh.	51	Erd	4 Ver.
147	Square Turn Tractor Co., Norfolk, Neb.	Square Turn	18	35	.....	.....	3200	7800	1,875	2 Wh.	61	Clim.	4 Ver.
148	Stinson Tractor Co., Minneapolis, Minn.	Stinson	18	36	4	32	4750	6550	.....	4 Wh.	60	Beav.	4 Ver.
149	Topp-Stewart Tractor Co., Clintonville, Wis.	B	20	35	4-6	30	4500	6500	3,000	4 Wh.	42	Wauk.	4 Ver.
150	Turner Mfg. Co., Port Washington, Wis.	Turner-Simplicity	12	20	2-3	24	2300	4000	1,395	2 Wh.	54	Wauk.	4 Ver.
151		Turner-Simplicity	14	25	3-4	28	2600	4400	1,675	2 Wh.	54	Buda	4 Ver.
152	U. S. Tractor Co., Minneapolis, Minn.	U. S. B	12	22	.....	.....	2000	3900	975	2 Wh.	60	Gile	2 Opp.
153		U. S. C	18	30	.....	.....	3000	4100	1,450	2 Wh.	60	Erd	4 Ver.
154	Wallis Tractor Co., Racine, Wis.	Cub Junior	15	25	2-3	24	2000	3250	.....	2 Wh.	48	Own	4 Ver.
155	Waterloo Gasoline Engine Co., Waterloo, Iowa.	Waterloo Boy	12	25	3	24	2000	6000	.....	2 Wh.	52	Own	2 Hor.
156	Wichita Tractor Co., Wichita, Kan.	A	8	16	2-3	.....	1500	3500	1,025	2 Wh.	60	Gile	2 Opp.
157	Wisconsin Farm Tractor Co., Sauk City, Wis.	E	16	32	3-4	28	3500	5240	2,250	2 Wh.	52	Clim.	4 Ver.
158	Yuba Mfg., Co., Marysville, Cal.	Yuba Ball Tread	12	20	.....	.....	5000	6750	2,900	2 Cr.	.....	Wauk.	4 Ver.
159		Yuba Ball Tread	20	35	.....	.....	5000	10250	4,700	2 Cr.	.....	Wis.	4 Ver.
160	Zelle Tractor Co., St. Louis, Mo.	Zelle	12	25	2-4	24	2000	3800	.....	2 Wh.	54	.....	4 Ver.

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Auto Opp., opposed. **Fuel**—G, gasoline; K, kerosene; D, distillate. **Carburetor**—Ray., Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Zeph., Zephyr; Eas., Atwater Kent; Sum., Sumter; Eise., Eisemann; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; Spec., special. **Gearset**—B. & spur gear; G., gear; Ch., chain; R. P., roller pinion. **Drive**—Op., open; In., inclosed.

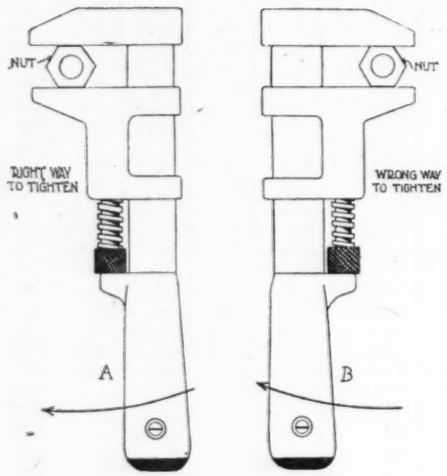
Their Technical Specifications—Concluded

Line No.	Bore and stroke	Normal R. P. M.	Fuel	Make and size of carbureter	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Gearset type	Belt pulley diameter	Belt pulley R. P. M.	Belt speed F. P. M.	Speeds forward	Speed range, M. P. H.	Recommended plowing speed	Final drive	Drive	Furrow wheel	Line No.
80	7 x 8	550	G-K	2 -King.	.....	K-W	Own	.....	.....	32	275	2300	2	1-2.3	.....	G.	Op.	.....	80
81	4 x 5	1000	K	Holl.	Own	Own	Own	S. G.	9	1000	2500	3	1-15	2½	Worm	In.	Yes	81
82	5½x 6½	800	G-K	1-½King.	Own	K-W	B. & B.	.....	Sl. G.	14	750	2750	3	1½-4	2½	S. G.	Op.	Yes	82
83	4 x 6	900	K	1¼-King.	Ben.	King.	Own	Nutt.	Sl. G.	13	900	3075	2	2.3-3.8	2.3	G.	Op.	Yes	83
84	3½x 5¼	1150	G-K	1-King.	.....	King.	.....	.....	Fr.	.....	.....	.....	.....	1-15	2½-3	Ch.	Op.	Yes	84
85	4¾x 6½	875	G	1¾-Ben.	Own	Dixie	Own	Own	.....	16	500	2100	2	2½-3	.....	G.	In.	.....	85
86	4¾x 6¾	850	G-K	1½-Ben.	Ben.	K-W	Own	.....	Sl. G.	11	850	2600	2	2-2½	2½	Ch.	In.	No	86
87	6½x 7	750	K	1½-Scheb.	.....	K-W	Own	Own	Sl. G.	14	750	2750	2	1¾-3.8	3	G.	Op.	Yes	87
88	4 x 6	1000	G-K	King.	Ben.	Dixie	B. & B.	.....	Sl. G.	13	.....	2600	2	2¼-4	3	G.	Op.	Yes	88
89	3¼x 4½	1600	G-K	1¼-Zen.	Ben.	Dixie	Own	Own	Plan.	12	800	2400	3	1¾-7	2½	G.	In.	No	89
90	6 x 7	600	G-D	1½-King.	Donal.	K-W	Own	Own	Sl. J. C.	14	625	2290	2	2½-3½	2½	G.	In.	No	90
91	7½x 8	550	G-D	2-King.	Donal.	K-W	Own	Own	Sl. J. C.	16	467	2649	2	2⅝-3	2⅝	Ch.	In.	No	91
92	4¼x 5¾	900	G-K	1¼-King.	Own	King.	Own	Own	S. G.	13	900	3063	2	2½-4	2 ½	G.	Op.	Yes	92
93	5 x 6½	400	K	1½-Strom.	Ben.	Dixie	Cotta	Foote	S. G.	14	600	2250	2	1½-3½	2½	.....	.....	No	93
94	7½x 9	400	G-K	2 -King.	Ben.	Dixie	Own	.....	S. G.	30	400	3200	2	1½-2¼	2¼-2½	G.	Op.	No	94
95	3⅛x 4½	950	G	1 -Scheb.	Ben.	A-K	Own	Own	Sl. G.	6	1200	1880	4	2.1-3.6	2½	Ch.	Op.	Yes	95
96	6½x 8	500	K-D	Own	Own	K-W	Own	Own	S. G.	20	500	2600	2	1.8-2.5	2.5	Ch.	Op.	No	96
97	8½x12	400	K-D	Own	Own	K-W	Own	Own	S. G.	20	400	2060	2	1.8-2.5	1.8-2.5	Ch.	Op.	No	97
98	5¼x 8	575	K-D	Own	Own	K-W	Own	Own	S. G.	18	575	2800	2	1.8-2.4	2.4	Ch.	In.	No	98
99	4 x 6	900	G-K	1½-Ben.	Ben.	Eise.	B. & B.	.....	Sl. G.	12	725	2300	2	2¼-4	2⅜	G.	In.	Yes	99
100	3¾x 5¼	950	G-K	1-Ben.	Ben.	Dixie	Own	Own	S. G.	10	350	2500	2	2⅝-6	2¾	G.	In.	Yes	100
101	6½x 8	.....	K	1½-Scheb.	Ben.	K-W	Own	Own	Sl. G.	16	650	2700	2	2-4½	2½	G.	In.	Yes	101
102	5 x 5	800	K	1½-Scheb.	.....	A-K	.....	Own	.....	24	320	.....	2	2.2-3.25	.....	G.	.....	.....	102
103	5¼x 6	800	K	1½-Scheb.	.....	A-K	.....	Own	.....	28	350	.....	1	2¼	.....	G.	.....	.....	103
104	6¼x 7	600	K	2 -Scheb.	.....	K-W	.....	Own	.....	32	275	.....	1	2¼	.....	G.	.....	.....	104
105	7½x 8	450	K	2 -Scheb.	.....	A-K	.....	Own	.....	34	275	.....	1	2¼	.....	G.	.....	.....	105
106	6 x 7	750	K	1½-King.	Own	.....	Own	Own	Sl. G.	11	750	2100	1	2½	2½	G.	Op.	Yes	106
107	6 x 7	750	K	1½ King	Ben.	.....	Own	Own	Sl. G.	11	750	2100	1	2½	2½	G.	Op.	Yes	107
108	5 x 6½	650	G-K	1¼-Ray.	Ben.	Dixie	.....	Own	.....	14	800	2600	2	2½-5	.....	Ch.	In.	Yes	108
109	4½x 6	950	G-K	1⅜-King	Own	Dixie	Own	Nutt.	Sel. G.	18	475	2200	2	1½-3	2½	G.	In.	Yes	109
110	4¼x 5¾	900	K	1¼ King.	.....	Eise.	Bier.	.....	Sel. G.	12	900	.....	2	2½-4	2½	G.	.....	Yes	110
111	4½x 6	1000	G-K	1½-Zen.	Own	Dixie	Own	Own	Sel. G.	16	597	2500	2	1½-4	2.7	G.	In.	No	111
112	5¾x 7	.....	G	2½-Any	.....	Dixie	Spec.	Spec.	Sel. G.	.....	.....	.....	3	.....	2-4	Worm	In.	.....	112
113	5 x 6½	.....	.....	Strom.	.....	Dixie	.....	.....	.....	12	900	2600	2	2½-4½	.....	.....	.....	Yes	113
114	4¼x 5	900	K	1¼-King.	Own	K-W	Own	Own	Sl G.	9	900	2100	3	1½-6	3	G.	In.	No	114
115	5¼x 6	750	K	1½-King.	Own	K-W	Own	Own	Sl. G.	13	750	2500	3	1½-6	3	G.	In.	No	115
116	4¼x 5¾	1000	G-K	1¼-King.	Own	Dixie	Own	Own	Sl. J. C.	12	800	2512	2	2-3	2.5	S. G.	Op.	No	116
117	4¼x 6	1000	K	1¼-H-S	Ben.	Bosch	B. & B.	.....	Sl. G.	16	650	.....	2	2.2-2.9	.....	.....	In.	Yes	117
118	5 x 7½	650	G-K	1¾-King.	Ben.	K-W	Own	Own	Sl. G.	17	528	2400	2	2-2¾	2-2¾	S. G.	In.	No	118
119	6¼x 8	600	G-K	2 -King.	.....	K-W	Own	Own	Sl. G.	20	600	3150	2	1.4-2	2	S. G.	Op.	No	119
120	7¼x 9	500	G-K	2½-King.	.....	K-W	Own	.....	.....	23	500	2900	1	2	2	S. G.	Op.	No	120
121	7¼x 9	500	G-K	3 -King.	.....	K-W	Own	.....	.....	23	500	2900	1	2	2	S. G.	Op.	No	121
122	3½x 5	1800	G	1¼-Holl.	Ben.	Remy	B. & B.	Own	Sl. G.	9	1200	2900	1	3½	3-3½	S. G.	In.	Yes	122
123	3¾x 4	900	G-K	1 -King.	Ben.	K-W	Bier.	Foote	Sel. G.	.....	750	.....	1	2	2	Ch.	Op.	No	123
124	4 x 6	800	G-K	1¼-King.	Ben.	K-W	Bier.	Foote	Sel. G.	.....	500	.....	2	1½-2¼	2	Ch.	Op.	No	124
125	4¾x 6	800	G-K	1½-King.	Ben.	K-W	Own	Own	Sel. G.	.....	565	.....	2	½-2¼	1⅞	Ch.	Op.	No	125
126	3½x 5¼	1000	G-K	1 -Ben.	Ben.	.....	Rock.	Own	Fr.	10	{ 600	.....	6	2-3½	2-2½	S. G.	In.	Yes	126
127	4½x 5¾	900	K	1¼-King.	Ben.	Eise.	Rock.	Own	Fr.	10	{ 1000	.....	6	2-3½	2-2½	S. G.	In.	Yes	127
128	4¼x 5¾	900	G-K	1½-King.	Ben.	K-W	Own	Own	Sel. G.	20	400	1992	2	2½-5½	2½	Ch.	In.	Yes	128
129	4¾x 6¾	800	G-K	1¼-King.	Ben.	K-W	Own	Own	Sel. G.	24	360	2160	2	2½-5½	2½	Ch.	In.	Yes	129
130	5½x 6½	750	G	1½-Ben.	.....	Dixie	Own	Own	Sel. G.	11	750	2100	3	1¾-4	2½	Ch.	Op.	No	130
131	4¼x 5½	1000	K	1¼-King.	Own	Eise.	Own	.....	Sl. G.	12	1000	3140	2	2⅝-4	.....	S. G.	Op.	Yes	131
132	4¼x 5½	1000	K	1¼-King.	Own	Eise.	Own	.....	Sl. G.	12	1000	3140	3	1¾-4	.....	S. G.	In.	Yes	132
133	5 x 6½	750	K	1½-Strom.	Ben.	Eise.	B. & B.	Nutt.	Sl. G.	14	650	2450	2	2½-4	2¼-2½	G.	.....	Yes	133
134	5½x 6	750	K	1½-King.	Ben.	K-W	Own	Own	Sl. G.	14	750	2750	3	1¾-4	2½	Ch.	In.	Yes	134
135	7 x 8	600	K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	18	600	2700	3	1¾-4	2¼	S. G.	In.	No	135
136	4 x 6	900	G-K	1¼-King.	Ben.	King.	.....	.....	Fr.	14	1065	3900	7	1⅞-4	2	S. G.	In.	Yes	136
137	9 x12	500	K	2 -Own	Own	none	Own	Own	Sl. G.	20	500	.....	1	1½-3	2¼	G.	.....	No	137
138	4¼x 5½	800	G-K	1 -King.	Ben.	Dixie	Own	.....	Fr.	12	700	2200	7	1-4	2¼	S. G.	Op.	Yes	138
139	4½x 6¾	750	G-K	1⅜-King.	Ben.	Dixie	Own	.....	Fr.	14	600	2200	7	1-4	2¼	S. G.	Op.	Yes	139
140	4 x 6	900	K	1½-King.	.....	King.	.....	.....	.....	18	600	2828	2	2-3	2½	Ch.	Op.	.....	140
141	4½x 5¾	1000	K	1¼-King.	Ben.	Bosch	Own	Cotta	Sl. G.	12½	915	3000	3	1½-3¾	2¼	S. G.	Op.	.....	141
142	4½x 6¾	950	K	1¼-King.	Ben.	Dixie	Own	Cotta	Sl. G.	12½	810	2850	3	1½-3¾	2¼	S. G.	Op.	.....	142
143	5½x 7	825	K	1½-King	Ben.	Dixie	Own	Own	Sl. G.	12½	840	2749	2	2.4-3¾	2.4	S. G.	Op.	.....	143
144	8 x10	525	K	2 -King.	Ben.	Bosch	Own	Own	Sl. G.	24	525	3310	2	2-4½	2	S. G.	Op.	.....	144
145	3½x 5¼	1050	G	1 -Ben.	Ben.	Dixie	B. & B.	Own	.....	12	890	2800	2	2½-4½	2½	R. P.	In.	Yes	145
146	4 x 6	900	K	.....	Ben.	Dixie	.....	.....	.....	.....	900	.....	2	2-3½	2½	Ch.	Op.	No	146
147	5 x 6½	850	G-K	1½-Strom.	Ben.	Dixie	Own	.....	.....	12	850	1838	2	2-2½	2	S. G.	In.	Yes	147
148	4¾x 6	950	K	1¼-King.	Own	Dixie	Own	.....	.....	12½	1200	3900	1	.....	2-3½	S. G.	In.	Yes	148
149	4¾x 6¾	900	G	King.	Ben.	Eise.	B. & B.	Own	.....	12	.....	2700	3	1¼-2½	2⅜	G.	In.	.....	149
150	3¾x 5¼	1000	K	1¼-King.	Ben.	Dixie	Own	Foote	Sel. G.	14	600	2200	2	1½-3	1¾-2½	R. P.	Op.	Yes	150
151	4½x 5½	1000	K	1¼-King.	Ben.	Dixie	Own	Foote	Sel. G.	14	600	2030	2	1½-3	1¾-2½	R. P.	Op.	Yes	151
152	5½x 6½	850	G	.....	Ben.	.....	.....	.....	.....	12	900	.....	2	2½-2¾	.....	G.	In.	Yes	152
153	4½x 6	900	K	.....	Ben.	.....	.....	.....	.....	12½	1000	.....	2	2¼-5	.....	G.	In.	Yes	153
154	4¼x 5¾	900	G-K	1¼-Ben.	Ben.	K-W	Own	Own	Sel. G.	18	430	2030	2	2½-3½	2½	S. G.	In.	Yes	154
155	6½x 7	750	K	1½-Scheb.	Own	Dixie	Own	.....	Sl. G.	14	750	2750	2	2¼-3	2¼	S. G.	Op.	Yes	155
156	5 x 6½	750	G	1¼-King.	Ben.	A-K	Pier.	Own	Sl. G.	12	750	2358	1	2¼	2¼	R. P.	In.	Yes	156
157	5 x 6½	800	K	1½-Strom.	Ben.	Eise.	B. & B.	Foote	Sl. G.	16	575	2660	2	1¾-4	2 ½	S. G.	Op.	Yes	157
158	4½x 6¾	700	D	1¼-Ens.	Donal.	Bosch	B. & B.	Own	Sl. G.	12	700	2200	3	1.5-4	2.08	.....	.....	No.	158
159	5¼x 7	700	D	1½-Strom.	Donal.	Bosch	.. ..	Own	Sl. G.	Opt.	700	.....	2	2.06-3.28	2.06	.....	.....	No	159
160	4½x 5½	900	K	1¼-Car.	.....	.....	.....	....	Sel. G.	12	800	2500	4	1-5	2½	S. G.	In.	No	160

matic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten., Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., vertical; Hor., horizontal; Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Car., Carter; Perr., Perrin-Ingram. **Air Cleaner**—Donal., Donaldson; Ben., Bennett; Holl., Holley. **Magneto**—A-K. 8, Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding jaw clutch. **Final drive**—S. G.,

The Motor Car Repair Shop

Practical Maintenance Hints



Tool Etiquette

WHEN supposedly good mechanics do not handle tools properly, what may be expected of the beginner or the man who takes care of his own car? Not one man in twenty handles a monkeywrench as he should for effectiveness; there is a right and a wrong way, as shown.

To be sure, there is a tendency to spread the jaws of the wrench whichever way is used, but in A this tendency is minimized, the greater part of the strain coming at the back end of the jaws, where they are sustained by the frame of the wrench. In B, however, the tendency is to spread the jaws, and instead of holding the nut firmly the jaws are opened, strained and permitted to slip over the edges of the nut and "round" them so it will be almost impossible to turn the nut with any sort of a wrench unless it is one of the pipe variety.

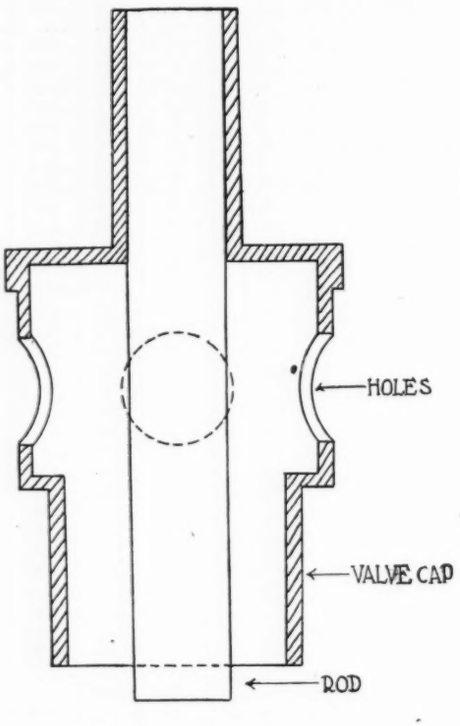
The way a Stillson wrench should be used is the exact way a monkeywrench should be treated. In the case of a Stillson it would be inoperative if attempted as shown at B, whereas it will hold if turned as at A. Try a pipe wrench and see how it will and will not work and then apply this practice with the monkeywrench.

Carbon on Valve

When a piece of carbon lodges on the seat of a valve it usually may be pounded off by increasing the clearance between valve stem and pushrod to somewhere near $\frac{1}{16}$ in., using this adjustment for a day or two.

Use Starter Carefully

The starter should not be abused. If the engine does not start on the first few turns, stop and look for trouble. Do not keep cranking until the battery is badly run down. Usually the difficulty is something simple. Lack of gasoline or a switch off are common causes.



Tube Deflater

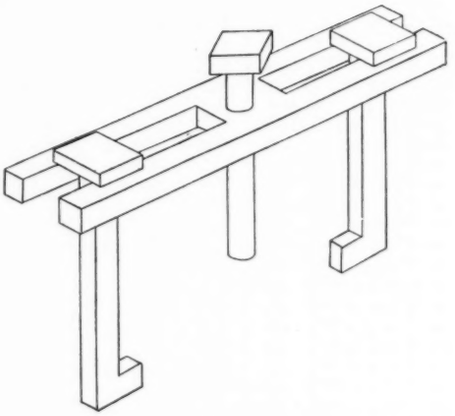
When a tube is to be deflated the usual method is to remove the valve. A quicker method is to take an ordinary valve cap and modify it as shown. A small rod is inserted in the center, and the side is drilled with four small holes. When the cap is screwed in place on the tube it opens the valve and allows the air to escape.

Increasing Power

The repairman is often asked by the car owner to do something to the car that will make it develop more power and have more get-up-and-go spirit. The general method is to rebore the cylinders, fitting in oversize pistons. The results are more power, a big bill to the car owner, reduced gasoline mileage, a dissatisfied car owner and a lost customer for the service station most likely.

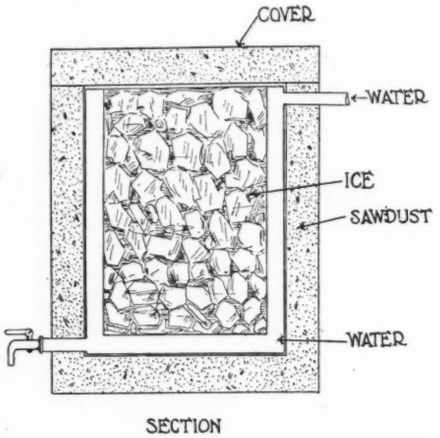
A method to increase the car's power without reboring is as follows: Use an old valve seat reamer and grind it down so its diameter is about $\frac{1}{16}$ to $\frac{1}{8}$ in. less in diameter. Then bore the port out with this reamer. The port opening is made larger by about $\frac{1}{8}$ in.

This method does not decrease the gasoline mileage. The increased power results from the increased volumetric efficiency. The seat of the valve will not be damaged in any way, because the part bored out never is used. It is claimed by one man who tried this system he increased his power 7 per cent.



Reversible Jaws

This puller is made to do double duty in that it may be used for internal or external work by virtue of its jaws, which can be made to point inward or outward as desired. The distance between the jaws can be adjusted instantly since they are designed to slide in slots; likewise to make them point outward when they are pointing inward quickly is accomplished by sliding them out of the slots, reserving them and sliding them back in again.



SECTION

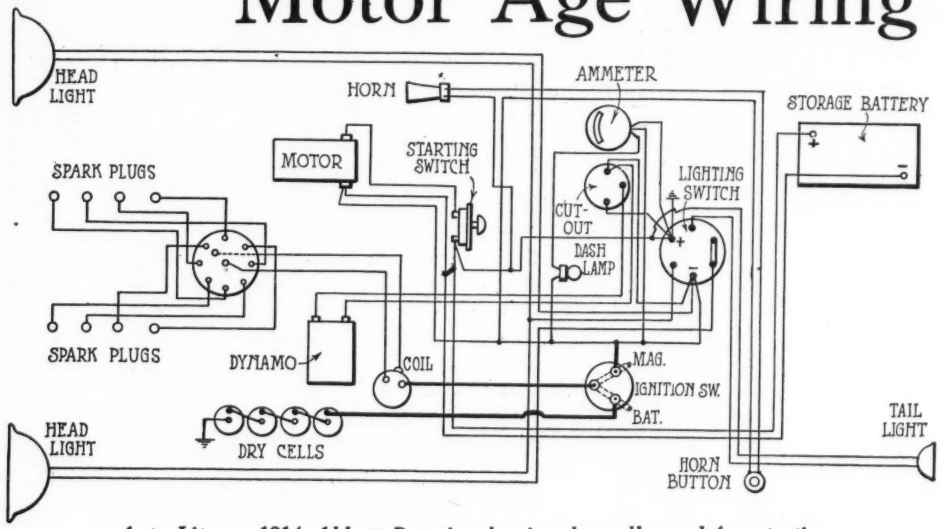
Shop Water Cooler

Plenty of refreshing water means better work in garage and shop this summer, and now is the time to plan for it. The cooler shown is designed to cool the regular city water supply and therefore will give plenty of ice water with a minimum of trouble.

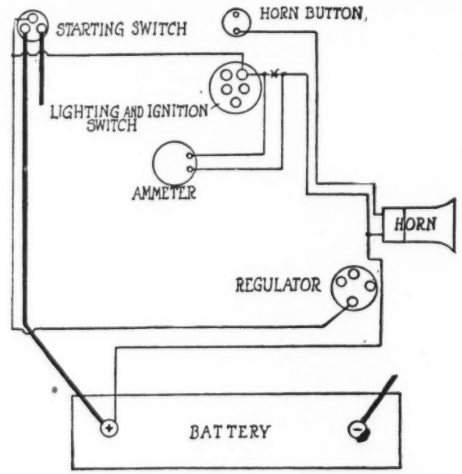
The cooler may be mounted on a suitable stand or wall bracket and consists of a home-made metal container with an inner container proportioned so that between the two there is space for a 3-in. layer of sawdust. The cover is likewise 3-in. thick and filled with sawdust. This is to insure good heat insulation and thus conserve the ice.

Directly inside of this container is a waterjacket and the space inside of it is packed with ice.

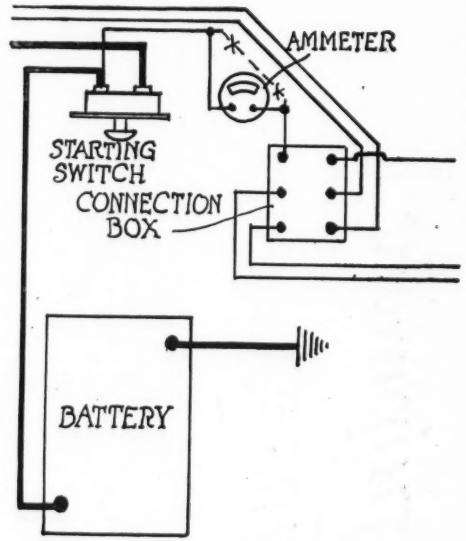
Motor Age Wiring Diagram Chart No. 21



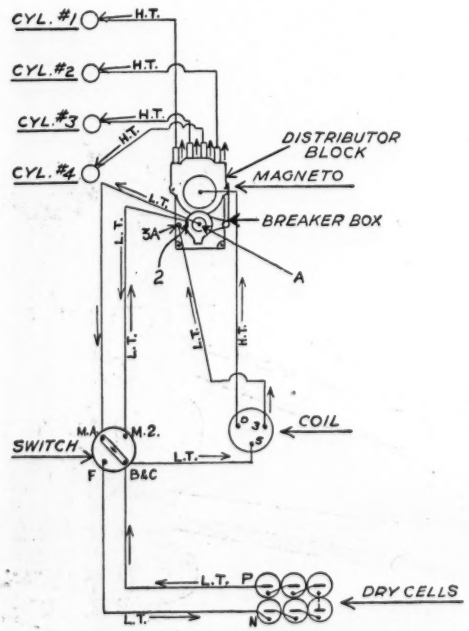
Auto-Lite on 1914 *Abbott-Detroit, showing dry cells used for starting*



Connecting ammeter on 1915 *Grant*



Manner of connecting an ammeter on 1918 *Chalmers*

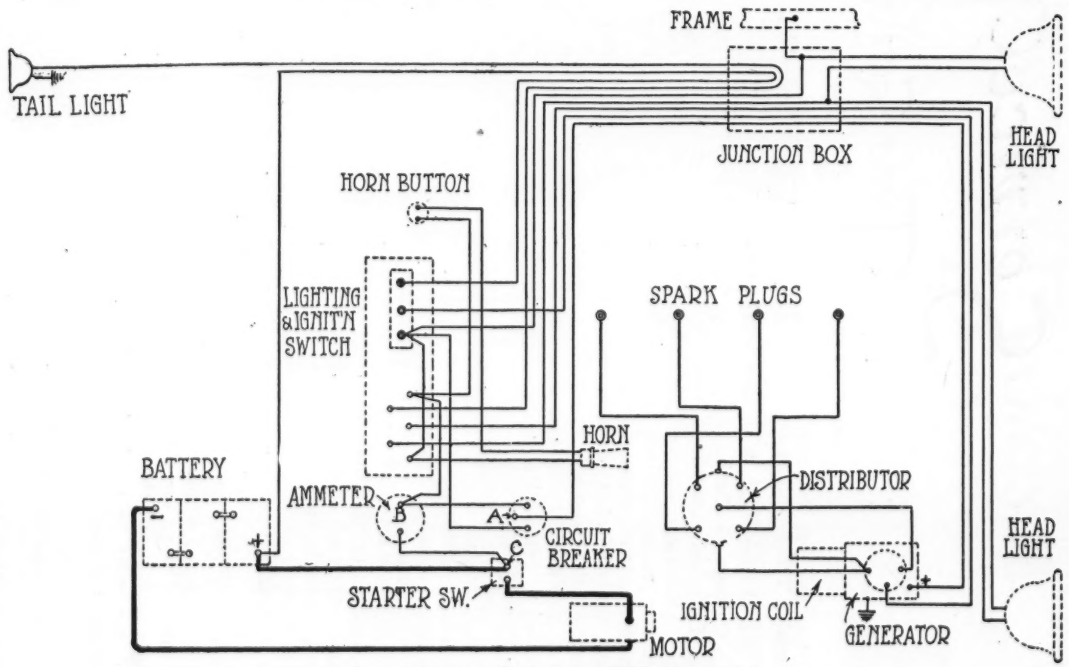


Splitdorf ignition on Abbott-Detroit, Model K

Abbott-Detroit—March 20
Alter—Nov. 14
Apperson—March 6
Buick—Nov. 21
Cadillac—Dec. 19
Case—Feb. 27
Chalmers—Feb. 20
Cole—Jan. 23
Chevrolet—Nov. 28
Detroiter—March 6
Dodge—Dec. 12
Dort—March 13
Elgin—Feb. 27
Empire—March 13
Ford—Jan. 30
Grant—Feb. 27
Hudson—Dec. 5
Hupmobile—Feb. 13
Interstate—March 13
Krit—Feb. 6
Little—March 20
Locomobile—Jan. 23
Marion—March 6-20
Marmon—Jan. 9
Maxwell—Jan. 16
Mercer—Jan. 23
Michigan—March 20
Mitchell—Jan. 9
Oakland—Jan. 2
Oldsmobile—Jan. 23
Overland—Nov. 7-14
Regal—Feb. 6
Reo—Feb. 27
Scripps-Booth—Dec. 26
Studebaker—Dec. 26

THIS WEEK

Abbott-Detroit—Grant—Chalmers—Chevrolet



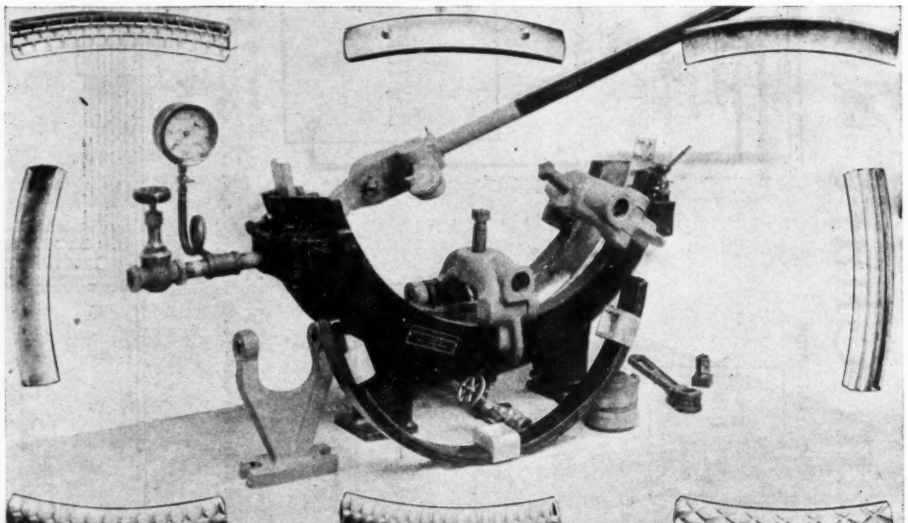
Auto-Lite installation on 1917 *Chevrolet*

Service Equipment

Time Savers of the Shop

Variable Tread Vulcanizer

THE Western Tire & Rubber Works Co., Chicago, is offering a vulcanizer capable of producing treads of variable design. The machine can produce the ribbed tread familiar to cord tires, diamond tread, square lug tread, a commercial tread, a bar tread and several others. A feature of the treader is the snap fast lock which operates much like the snap on lock on a plumber's pipe vise. It is claimed the design of the machine prohibits the entrance of air, because of its special anti-air trap.



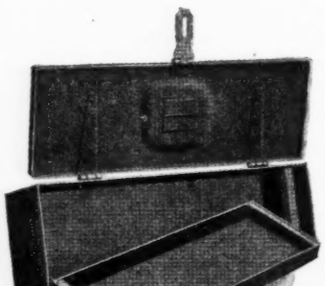
Western vulcanizer for variable treads

Pistol Grip Control

The Black & Decker Co., Baltimore, Md., is manufacturing a new drill especially for small work such as the garage and repair-shop generally have. The drill is equipped with a pistol grip control that makes it operate much like an air hammer. The drill is a very light affair, capable of being operated with one hand. The pistol grip control offers the advantage that the drill is not moved when the current is shut off, because shifting of the hands on the grip is not necessary to reach the switch. This feature will stop the broken drill expense.

Acme Cylinder Grinder

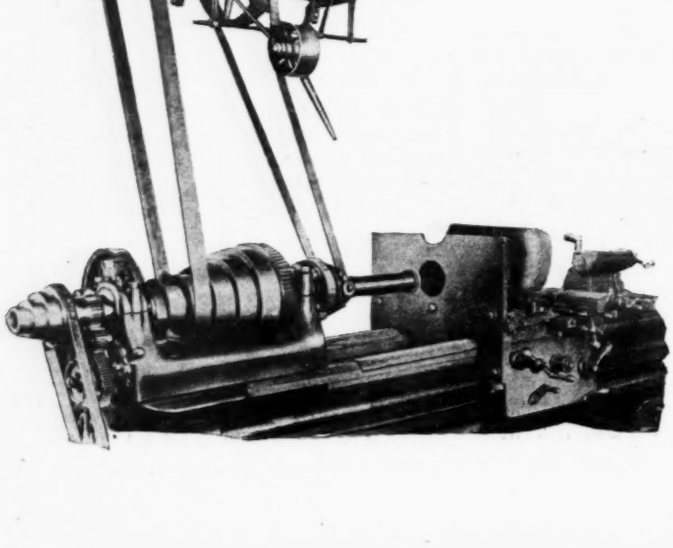
The Acme cylinder grinder, made by the Continental Grinder Co., Minneapolis, Minn., is an inexpensive device that will grind and rebore the cylinders of any style of engine block. Any shop that has a lathe can use this grinder. It is attached to the lathe like any ordinary chuck except that another belt drive is required to give the circular motion to the grinder. The grinder does not require that the cylinders be rotated. That has been one of the drawbacks to many reboring machines, and since space and cost are the controlling factors in most every case, cylinder grinding machines have not received the attention from the service men they might have, had they cost less and taken up less room. The Acme grinder will grind any cylinder from 2⅞ in. in diameter and up, and as much as 12 in. in depth. Thus, the limits of the grinder will allow of work on any motor car now being made. It has a longitudinal and vertical adjustment for the work, variable feeds for table travel, and micrometer adjustment for close grinding. The illustrations show how the grinder is attached to the lathe. The grinder itself with its tools and grinding are included in the price of $175.



Lyons steel toolbox

Handy Steel Toolbox

The Lyon Metallic Mfg. Co., Aurora, Ill., makes steel products which systematize the shop. Among these is a steel toolbox for the mechanic. The box is sturdily made and has a tray for keeping the small tools separated from the rest. A substantial lock connection is provided.



Acme cylinder grinder, left, and B. & D. drill for garages, below

Among the Makers and Dealers

Short Trade Notes

CANADIAN Ford 100 Cars Daily—The Ford Motor Car Co. of Canada, Ltd., is producing 100 cars daily and anticipates greatly increasing the output within the next month.

Host with Lincoln Motor—S. A. Host has resigned as director of publicity of the Lincoln Highway Association to become connected with the Lincoln Motor Co., Detroit, under Frank G. Eastman, advertising manager.

Spade Heads Service Station—Ira M. Spade, Grand Rapids, Mich., has been appointed manager of the Goodyear service station. The station has just inaugurated 24-hr. service week days and Sundays.

Electrical Service for Columbus—The Bissinger Magneto Co., Columbus, Ohio, is official distributer for the Bosch magnetos and USL storage batteries in that city. This is a new firm which has just opened its service station.

Wales Back with Raybestos—Lieut. E. A. Wales, formerly chief of production, motors division, Quartermaster Corps, Cleveland, Ohio, has re-entered the employ of the Raybestos Co., Bridgeport, Conn., and will resume his pre-war duties as manager of its Detroit office.

To Handle Cars Also—The Van Every-Walbrink Motor Sales Co., Grand Rapids, Mich., has been made distributer in that territory for Scripps-Booth cars. This company was formerly known as the Denby Truck Sales Co. and has handled the truck line exclusively. The truck department will be continued.

Tip Top Tire Shop—The Tip Top Tire shop has just been opened in Toledo, Ohio, by Ralph Ried, formerly with the Toledo Tire & Repair Co., and Joseph G. Meads, who has been connected with several large tire repair firms. This company will specialize in vulcanizing work.

Rubber & Tire Profits—Net sales of the Lee Rubber & Tire Corp. are $536,029 ahead of 1917, according to the financial statement of the company for the year ended December 31, 1918. Net profits, after all the necessary deductions, amounted to $200,348, which is $177,759 more than $22,589 made last year.

New York Elgin Distribution—The Elgin Motor Distributing Co., New York, has been formed to take over the metropolitan distribution of the Elgin. The officers are: M. W. Sanger, president; E. L. Sanger, vice-president; Henry Weiss, secretary; Harry Sanger, treasurer, and David Sanger, assistant secretary.

To Make New Disk Rim—The Harvey Rim &Wheel Corp., Buffalo, N. Y., has been incorporated with a capital of $10,000,000. The company will manufacture a disk demountable rim. The rim, which is sectional and collapsible, is designed to be changed more easily and more quickly than any other type. The factory probably will be located in Buffalo.

Britton Heads Hartford Dealers—Charles O. Britton has been elected president of the Hartford, Conn., Automobile Dealers' Association; A. C. Hine, vice-president; Dwight A. Burnham, treasurer, and A. C. Rose, secretary. It was reported at the meeting that the recent annual show was the most successful ever held by the dealers. A dividend will be declared in the course of the next few days. Practically all the dealers reported a good volume of after show business with an increased number of prospects.

United Electric Repair Men—Durdley R. Safreed, formerly master electrician in Government service, is superintendent and C. W. Gabriel is manager of the newly established United Electric Repair Co., Columbus, Ohio.

Blank in Lynite Laboratories—M. H. Blank has been appointed chief engineer of the Lynite laboratories of the Aluminum Castings Co., Cleveland. He was recently honorably discharged as captain in the army. Previous to entering military service he was assistant engineer of the Premier Motor Corp.

Cann with Philadelphia Branch—Barry B. Cann, recently with the Packard Motor Car Co., Detroit, as expert efficiency representative, has been appointed sales manager for the Philadelphia branch of the Apperson, of which William T. Taylor is the head. Mr. Cann, who has devoted most of his time to sales organization work, is beginning to organize Philadelphia territory for the Apperson car.

To Combine Accessory Concerns—The Peters & Heron Co. is to be incorporated with a capital of $400,000 to take over the business of the Peters & Heron Dash Co. and the Nu-Back Fur Co., Columbus, Ohio, makers of accessories. The machinery of the two plants will be moved to the plant of the H. C. Phelps Co. Charles M. Peters, one of the founders of the Peters & Heron Dash Co., will be president and M. K. McGaughy will be general manager.

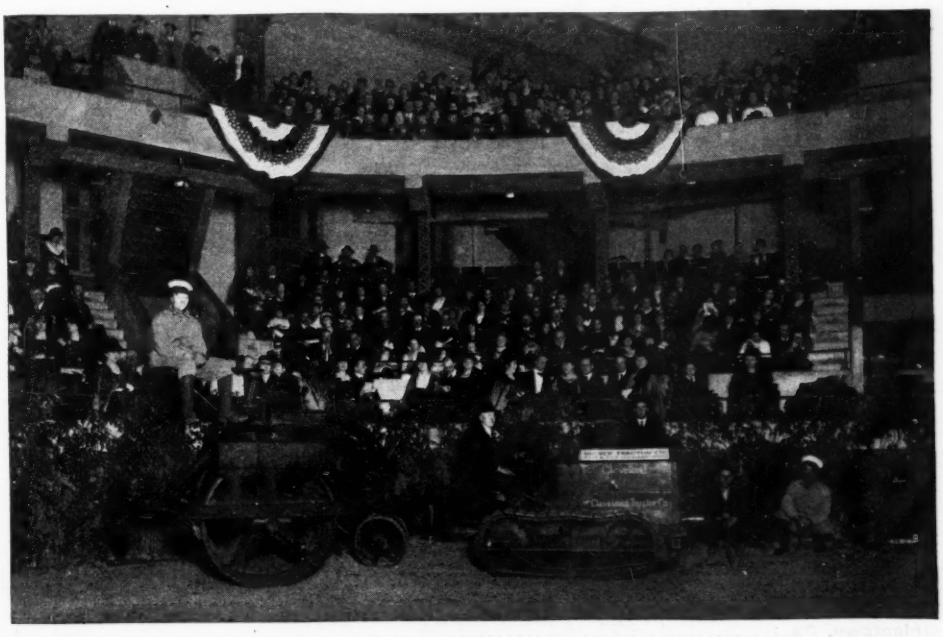
Whitten to Distribute Cars—J. E. Whitten, Peoria, Ill., has been appointed distributer for the Moline-Knight cars in central Illinois and has opened a salesroom and service station. He was formerly with Root & Van Dervoort, Moline, Ill. He also has taken the agency for the Scripps-Booth car. H. C. Hammond, San Diego, Cal., has been appointed sales manager and A. E. Hood manager of the service station. The latter has been with the Republic Truck Co. in charge of the Chicago service station.

Canadian Studebaker Production—The Canadian plant of the Studebaker Corp. is now turning out fifteen machines daily, but this production will be run up shortly to fifty. This plant assembles the car only from parts received from Detroit and Canadian part makers. About 50 per cent of the material is manufactured by Canadian concerns.

New Hudson and Essex Agency—The Macon Motor Sales Co. has secured the Macon territory for the Hudson and Essex. F. Walthall, who has been associated with Hudson cars in this vicinity for some time, will be in charge of the service department. The concern is carrying a complete line of parts and prepared to make immediate deliveries on both cars.

Block Heads Philadelphia Dealers—Louis C. Block is the new president of the Philadelphia Automobile Trade Association, succeeding A. E. Maltby. The others officers are: Lee J. Eastman, vice-president; H. B. Harper, secretary; J. E. Gomery, treasurer. The association decided unanimously to participate in the welcome to the National Association of Motor Truck Sales Managers, which will convene here April 11-12.

Johnson Heads Detroit State Sales—W. E. Johnson has been made sales manager for Illinois of the Detroit Electric Co. and Peoria will be the distributing point for the entire state. Mr. Johnson is senior member of the firm of Johnson & Moody. He handles the electric car department and made such a notable record in sales last year it was decided to place him in charge of the state. His partner is distributer of the Reo car and has nine counties in his territory. This is to be increased to twenty-five counties during the remainder of the year.



THE TRACTOR AT A STOCK SHOW—The Hoover Tractor Co., Wichita, Kan., sent in this picture. It shows a Cleveland used to smooth the arena track at a recent stock show. The track was of wet clay and the 8700-lb. roller proved too much for the horses

From the Four Winds

Glimpses at the World of Motordom

COLUMBUS Motor Club Growing—Seventy-five new members have been added to the Capital City Motor Club, Columbus, Ohio, since Jan. 1, and the club is planning to have a membership of 1500 by June 1.

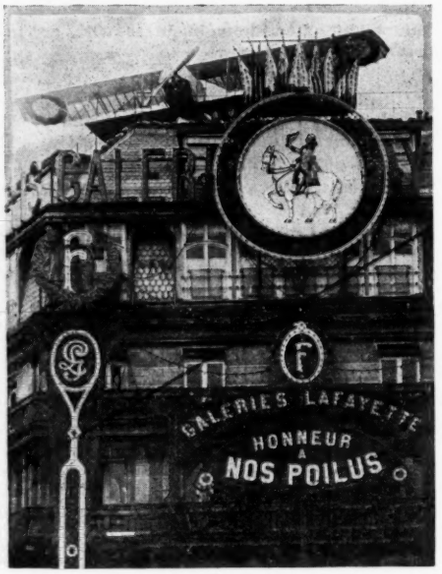
State Will Tax Load—Washington has passed the license fee bill whereby all trucks weighing 1000 to 6000 lb. will be taxed a flat rate of $10 and 10 cents a hundredweight carrying capacity. Over 6000 lb. the rate is $10 and 50 cents a hundredweight.

Air Service Club Is Formed—The Air Service Club of America has been organized by leading Army flyers to promote the social interests of aviators and to enliven the esprit de corps of the army flying branch. The club has leased the residence of Dr. John W. Cox in New York.

Cleveland Club Fights Grade Crossings—The Cleveland Automobile Club is renewing agitation for the elimination of grade crossings in Cleveland, Ohio. The Cuyahoga county board of commissioners has asked the Erie railroad to send grade crossing engineers to Cleveland to look over the situation.

Violet Is Name of Motor Express—A new motor truck express route has been established between Detroit and Toledo. It is operated by the Violet Express Co., so named because its trucks are painted violet. Trucks leave Detroit each day except Sunday at 7 a. m. and from Toledo at 1 p. m. The Toledo terminal will be under Charles D. Keefer. The E-R Cartage Co. will care for the Detroit terminal.

Big Tobacco Crops; Car Sales—The publication of sales of February tobacco compiled by the state commissioner of agriculture has caused great enthusiasm among Kentucky dealers and distributers, for it means greater prosperity and bigger business for them. The banks are filled with money and the farmers are buying all kinds of cars, trucks, tractors and automotive equipment that will introduce modern efficiency and comfort into their life and work. The crop of 110,870,106 lb. sold for $35,118,629.62. The February sale of the previous year's crop of 4,675,260 lb. brought $1,054,522.99.



WHERE FRENCH PILOT LANDED—This is where Jules Vedrines landed when he established a new precedent in aviation by alighting on a roof 52 by 75 ft. with a plane 36 ft. wide

Dealers Present Sedan to Manager—When A. W. L. Gilpin, manager of the Milwaukee, Wis., assembling plant and Wisconsin sales division of the Ford Motor Co., recently expressed his determination to buy himself a touring sedan, several Ford dealers of the state decided it would be a pleasant surprise to present him with the car. A letter was sent to 250 Ford dealers inviting them to take part. Ninety-five per cent answered with their checks, and the Jesse A. Smith Auto Co. delivered a Hudson touring sedan to Mr. Gilpin's home one evening, explaining to the surprised Ford manager that it was an expression of appreciation from his dealer organization.

Weather Bureau Aids Motorists—As an aid to Arkansas motorists, daily bulletins on road conditions between Little Rock and Memphis, Texarkana and Fort Smith, three of the principal highways, are issued by the Little Rock office of the United States Weather Bureau. This bulletin is given with the daily weather forecast.

To Hold Decatur Show—The Malone Coal, Grain & Motor Co., Decatur, Ala., has opened a branch at Huntsville to handle Cadillacs, Oldsmobiles and Chevrolets. This company for two years has put on a rather pretentious show at Decatur and announces that another will be held this year in April. Offices in Huntsville will be with the North Alabama Motor Co.

$6,500 to Finish Dixie Highway—With a view to raising $6,500 needed to complete the Dixie highway, President C. L. Bonifield of the Cincinnati Automobile Club has asked members of the organization to contribute $2 each to a fund for that purpose. In his appeal President Bonifield asserts that the completion of the Dixie highway ranks with improved railroad terminals and river and harbor betterments.

How's This for Tractors?—The Salverson Brick Co., Petersburg, Ill., who purchased a tractor to haul shale from the coal mine to the brick manufacturing plant, uses it to handle five wagons, each carrying 5 tons, aggregating 25 tons a trip. The roads have been bad or the haul could be increased. As soon as the mud dries, the company will add another trailer, bringing the total pull up to 30 tons.

Some Motorists Are Joyful—There is joy in the camp of the motorists throughout Connecticut and those who have been nipped by ambitious country constables armed with dollar watches are elated that agitation has got around to the legislature to take away from the towns the right to try cases. What has happened to motorists in the past in some of the smaller towns, notably Berlin, where court usually was held on the judge's greensward, and in South Windsor, where everybody who was not on to the trap got caught, and again down Haddam way, where pressure was brought to bear to shoo away the constable, is imprinted in the minds of the fraternity.

Tractor Demonstrations Are Planned—The Northern Illinois Tractor Association was organized at Streator. The officers are: President, A. S. Johnson; vice-president, Louis Missel; secretary, Thomas Kennedy; treasurer, P. J. Hunt. The sum of $1,000 was subscribed to cover the preliminary expenses, and it was decided to stage a tractor demonstration. At the next meeting the organization will be completed and a date selected for the first demonstration. It is expected September will be decided upon. It is planned to pull off periodical exhibitions of plowing with tractors. The association will also foster the power farming industry of northern Illinois and take other steps to promote the welfare of the dealers in such machinery.

Coming Motor Events

SHOWS

Brooklyn, N. Y.	Motor Vehicle Dealers' Association, cars	March 22-29
Warren, Pa.	Automobile Dealers' Association	March 22-29
Trenton, N. J.	Auto Trade Association	March 22-29
Pittsburgh, Pa.	Automobile Dealers' Association	March 22-29
Utica, N. Y.	Motor Dealers' Association	March 24-29
Clinton, Iowa	Automobile Dealers' Association	March 26-21
Brooklyn, N. Y.	Motor Vehicle Dealers' Association, trucks	April 1-5
Montreal, Canada	Soldiers' Wives' League	April 5-12
Bridgeton, Conn.	Automobile Dealers' Association	April 5-12
Deadwood, S. D.	Deadwood Business Club	April 8-12
Bristol, Va.		May 10-17

MEETINGS

Chicago	National Petroleum Congress	March 25-28
Hot Springs, Va.	Automotive Equipment Association	June 2-6

RACES

Indianapolis, Ind.	May 31
Uniontown, Pa.	July 19
New York	July 26
Elgin, Ill.	Aug. 22-23
New York	Aug. 23
Uniontown, Pa.	Sept. 1
New York	Sept. 20
Cincinnati, Ohio	Oct. 1